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AVIATION

The Oldest American Aeronautical Magazine

TWIN WASP RADIAL ENGINES *for fastest Navy fighters*

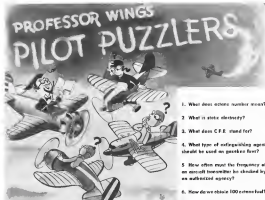
The United States Navy has selected Pratt & Whitney Twin Wasp radial aircooled engines for its newest Grumman F4F-3 fighters. At high altitudes where performance is extremely important, the speed of these new fighters is comparable to that of any service type airplane in the world.

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YOU know you send your score floating into the stratosphere or put it into a shell spin, but, through you may make a mistake on paper, there's no need to with aviation fuel.

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For the answer to your aviation-fuel and lubrication problems, call Shell Aviation Representative, Shell Building, San Francisco, Shell Building, St. Louis, or 80 West 39th Street, New York City.

ANSWERS

1 The correct number of a fuel is a measure of its ability to burn efficiently. To measure the unit known as the octane number of the fuel found in gasoline you send this number to a test engine, rate of the engine, "revs" per minute, or "rpm." The octane number is a measure of the fuel's ability to resist knocking or "pinging" in the combustion chamber.

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a different standard method. Before you can actually make a space change you must be in a position to make the change in the middle of any problem or question.

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AND BLACK



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AVIATION



PRODUCTS

AVIATION
October 1935



what a PHILLIPS SCREW thinks about

Well, I just got driven home in assembly and couldn't fly so though I was doing in a business. A short while ago I was in a taxi with some other Phillips Recessed Head Screws and then the fellow yanked me up and parked me onto the roof of a driver. I hung on for dear life, and even when he reached downtown to get into driving position, I didn't fall off. No ending up in a taxi can be for me.

The power driver turned pretty fast, but I kept on the straight and narrow, refusing to get crooked. It didn't hurt a bit. The tapered driver fit so snugly into the recess that the operator didn't have to use much pressure. I went through the dirty part, I didn't lose my head (of course, my family are famous for keeping their heads about their ears) and there was none of the shearing action that causes bars on slotted screws.

So here am I, safe and sound, and up to my neck in work. I have a secure grip on things and I've certainly got the type to go on the loose. And if anybody says I'm tight, that's all right because I can tighten. And if you want to be tight with money—I'd advise you to take up the rest of my family. Our cost of arms ready, you know, "It Costs Less to Use Phillips Screws."

P.S. You can get some pretty interesting information on how these screws are made from the Phillips Recessed Head Screws. Write for free folder to any of the firms listed below. No obligation.

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FASTENING COSTS*



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IT COSTS LESS TO USE PHILLIPS SCREWS

AVIATION
October 1940
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THE BEAUTIFUL NEW SENSATIONAL 1940

Taylorcraft
65

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Installed at extra cost

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See yellow section
last page

It Has What It Takes to Win Your Choice

A thrilling night and a marvelous flight await you in the new 1940 Taylorcraft now ready for your inspection. You'll instantly endorse over the sleek new coating so beautiful and modern in design—the relaxed comfort of their height seating—the two doors—the generous room—the new adjustable vestibule—and the increase of 80 lbs. in useful load capacity . . . You'll be amazed by the cabin quietness resulting from scientific sound-proofing and the newly engineered single under-cabin exhaust which reduces motor noise to a smooth rhythmic purr . . . You—and the quick, eager response to the controls—the fine balance and handling ease—the buoyant lift and snappy pick-up will truly delight you with Taylorcraft performance . . . Add to all that the fact that Taylorcraft's safety record is first in its class and you have the important reasons why you'll choose most wisely by deciding to fly and own the new 1940 Taylorcraft 65.

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BENDIX, NEW JERSEY

AVIATION
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William Macfield, Superintendent of Maintenance for TWA.

D. W. Tordella, Chief Engineer for TWA.

F. E. Jones, Assistant Superintendent of Maintenance for TWA.

FOR TWA

RECENTLY FROM TWA OFFICIALS came the news of seasoned men moving up into even more responsible positions, as the result of their enviable records.

Just as these men have made good for TWA, so Texaco Aviation Gasoline and New Texaco Airplane Oils have made good in the aviation industry.

TWA now flies nearly 30,000 miles a day, exclusively on Texaco Fuel and Lubricants which have served them for over 6 years. This TWA preference for Texaco is another reason for the fact that—

More scheduled airline mileage is flown with Texaco than with any other brand.

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5

AVIATION PRODUCTS

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PROPERTIES VARIED TO FIT AIRCRAFT APPLICATIONS



NICKEL ALLOY STEELS

As a safeguard against knockdown, Bellanca engineers specify 34 1/2% Nickel steel, SAE 5130, for bolts and eye bolts in their low wing model 25-90R. All stressed connections, indicated by white circles in this picture, are Nickel alloy steel. SAE 5130 can be uniformly heat treated to develop maximum strength with minimum bulk and weight.



Requirements of differing applications dictate the properties to be developed in varied Nickel alloy steels. Typical examples in this automatic landing gear, developed by Hamilton Standard engineers, include stressed parts are SAE 5131 and SAE 4130 Nickel and Nickel-Hydrobromide alloy steels respectively which withstand crushing loads, maintain alignment and resist fatigue.

CORROSION AND FIRE RESISTANCE: Notable advances have been made in using 18% chromium - 8% Nickel type stainless steels in the construction of wing, tail and fuselage assemblies. Properly processed, these alloys combine excellent corrosion and fire resistance with high mechanical properties.



To increase toughness and relieve distortion, 5% Nickel steel (SAE 5115) is used in a new type Henshaw propeller drive because years of experience have proved that Nickel alloyed into metals enables each metal, each kind of material to carry safely heavier loads. Through this Henshaw Universal, two engines drive a single prop through a simple overrunning clutch of SAE 5115 Nickel steel. Operating singly, either engine provides ample power to make a Lockheed Vega climb.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

AVIATION
October 1935

BUSINESS Stands Against War

Let us take a clear-eyed look at this thing we call War.

WAR is a political tool for domination or suppression, a device of fatality—unless it be waged in defense of our homes, our property or our rights—in the preservation of our liberty. War destroys everything it touches. So completely does it disrupt the order and progress of civilization that humanity suffers.

Disgracefully widespread amongst our people today is the assumption that our participation in the European War is inevitable. Some maintain the treaty and program of the federal government is likely to lead us into it; others fear that our sympathies will make us an easy prey to the propagandists; still others suspect that business and industry, in a blind greed for profits, may involve us in the conflict.

To give credence to such beliefs is to deny that we are rational individuals, endowed with intelligence and a will, or the ability, as a people, to profit by our own experience. In all human experience, death only is inevitable.

To say that Industry and Business want war or will encourage, directly or indirectly, our participation in the present war, is a vicious and deliberate lie.

The millions of us who, since the World War twenty-five years ago, have devoted all our efforts and energies to creating and building and improving that which we know today as American Industry and Business, are convinced that the destiny of this country can be wrought only in peace. We cannot, and must not, stand aside and watch even the little progress we have made since that war sacrificed to the passions of another world conflict. We who are trying to build a lasting heritage for those who will follow us only know that "there never was a good war or a bad peace".

Perhaps it is time to re-emphasize two of the three elements of our democratic faith, as simply stated by Abraham Lincoln, "that government of the people, by the people, for the people, shall not perish from the earth". Now, of all times, it will be wise to inform our political stewards that government by the people and for the people must be the guiding principle in what they do during the days to come, and that it is our will that in our country peace shall be preserved.

Only the gun and military courage of each of us, the determination to exert all our intelligence, all our individual influence in every way, can insure the preservation of peace for our country.

Preparedness we know to be the most effective preventive weapon against the threat of war. We must be certain, therefore, that we provide our air, land and sea forces with the best in armaments and material, in adequate supply to maintain property and imperatively our national responsibilities and defense.

Most important is that we as individuals, thus inspired, band together to exert the full strength of Industry and Business in the maintenance of peace.

If we are to succeed, we must be forceful, we must be articulate. To that purpose we pledge ourselves and the resources of our publications. An expression from our readers will greatly assist in such a mobilization of industrial opinion. Together, in this critical time, we can save America well!

James H. McMane

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

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way for the movement of ground forces in Poland, but how many have been used, and how many have been lost in the operation is not yet known. Mystery also surrounds the aerial activities of England and France. Several propaganda distribution flights are alleged to have been made by British bombers, and the French are reported to have prepared the way through the Saar valley in the West by heavy bombardment from the air. English sources reported heavy damage to German naval vessels from bombing raids over Calcutta. German sources showed damage, almost indication of heavy losses to raiders. And so it goes. It will probably be some weeks (unless some overwhelming aerial attack is made on the industrial and coastal cities of either side) before enough will be known to permit the beginning of the re-evaluation of the part played by aerial in modern war.

THE GERMAN STRATEGY at this stage obviously tells for offensive action in the east, with purely defensive activities in the west. Once the Polish situation has been liquidated, Hitler may either rest on his arms and wait for peace, or he may then throw the full weight of his military machine in a western offensive, depending upon the attitude of England and France. Clearly, the plan is to maneuver the latter two countries into the role of aggressor nations. Until this is accomplished we think that London or Paris, or Birmingham or Lyons need fear bombardment by German planes. There could be no more war in definitely since the due to a powerful refinement after the Polish copy—and Hitler must be well aware of this fact.

IN THE MEANTIME, we are facing a number of serious problems, the first of which is the pressing need for the revision of the Neutrality Act. Under the present law, it became mandatory for the President to embargo all shipments of aircraft in conflict between nations on their declaration of war. This means that orders now in process for British and French aircraft cannot be shipped out of this country upon completion. Unless something can be done to prevent, we are facing the prospect of seeing much needed aircraft for France and England lying idle in U. S. warehouses and on U. S. docks. Obviously, too, under present circumstances the door is closed to the placing of any further orders as long as the present act is enforced.

Not to be misunderstood, we are strongly in favor of preserving the neutrality of the United States as long as possible in the present European war. At the moment we see absolutely no reason why we should instantly become involved in active military operations in Europe. The last European war and its results are all too fresh in memory for us to wish anything else. But we do not believe that the solution lies in the passive line laid down by the Neutrality Act. At it now operates we are actually favoring the aggressor nations by restricting the supply of necessary materials to their opponents. The only sensible scheme is to put all on an equal basis and to offer our manufacturing facilities (in so far as we do not need them ourselves) on a strictly "cash-and-carry" basis to all comers. By the time this issue appears the President will have convened an emergency session of Congress and we strongly hope that Congress will reconsider its decision of last winter and permit the ending of embargoes that are now mandatory.

FOR THE SECOND TIME in its history AVIATION MAGAZINE is operating under conditions imposed by a World War. It is difficult to foresee what may happen in the course of the next few months and it is clear also that many things of tremendous interest to readers may be withheld behind clouds of official censorship from publication. Obviously also there will be restrictions imposed by our own government on the dissemination of information concerning our own plans and equipment. We will

continue, however, during this period of uncertainty, to report as fully as possible on international affairs throughout the world. We have had some first hand contact with aviation in Europe during the past two or three years and are maintaining close touch with our correspondents in Europe. In spite of the restrictions we hope to be able to bring in our readers an interpretation of events of the war in so far as they affect aviation.

A STRIKING CONTRAST to events overseas is the absence during the latter part of September of Air Power Week in the United States. Although we certainly have nothing to be ashamed of (or shamed about) as far as our military aviation is concerned, still our greatest pride is in the progress of our civil aeronautics. No need here to review in detail just what we mean, because above all else this magazine is dedicated to keeping its readers abreast of our own advances in commercial aviation. While there should be no surprising blackouts and no subject to momentary air mail warnings, our own cities still may feel the rattle of engines pouring overhead without fear, knowing that they mark only the continuous march of expansion of our air transport system which daily is absorbing thousands of passengers and hundreds of thousands of pounds of mail and cargo from point to point within the United States. Our fondest hope is that the skies over our cities of the future will be decked by passing wings—but by wings of contrails and not by wings of war.



A glider pilot makes active business in general flying. (Glenn Martin holds out a Southern Railway Airplane with Jack O'Malley (center) and Stanley Martin (right).)

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Landing Confidence

helps combat-pilots too



This off-assembly close-up view of Bendix Landing Gear's motion on the Cessna Model 33 Basic Combat airplane clearly shows the intricate size and strength and complexity of the unit. Fully assembled, hydraulic and pneumatic shock absorbers efficiently combine in an assembly of the most rugged, weight-conscious, work-saving design.



Military aircraft, such as the highly specialized Cessna Model 33 Basic Combat airplane powered, must frequently subject landing gears to extraordinarily anomalous service. Bendix landing gears are selected equipment. They effectively absorb the major impact of landing and cushion the lesser shocks of taxiing and take-off runs. Responsive steering and stopping, superior ground maneuverability.

Aircraft engineering staffs are urged to make fullest use of the experience and facilities for assistance available at Bendix.

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SHOCK STRUTS, TAIL KNUCKLE ASSEMBLIES

AVIATION
Circle 128

Side Slips

By
ROBERT OSBORN

✧ *Taxi Drove Free Press* was the editor's grand prize for sensational headlines with "Keep Cool, Nighty No!" This was the heading for an article describing how Major Sweeney and Captain De Vries managed to fly an Army C-38 transport loaded down with ice through a heavy rainstorm, en route from Denver to Kellogg Field.

✧ *Answered questions*: "Baldy Reported As Reappearing" made its reader at first of our six facts were nothing to do-quits with the police, but it seemed not simply to be that the Mid-



can Antonio Co. had reported two fighting bulls as baggage for a tourist.

✧ A couple of scientific problems have been raised and some doubt concerning the pollen which seems to blow about the country and cause hay fever sufferers, as well as more. They have involved themselves looking for ridges on the outside of the transport planes "wrecks reach of the co-pilot" and have added him to change the flies every twenty minutes.

We can imagine the poor co-pilot

*A line of hot wires possible with this

hoping that these devices don't become standard equipment on the airline transports, as he is already pretty busy flying the airplane and operating the radio, while the Captain studies over the manual pages in those better stock-market days.

✧ We certainly hope that the "Smoking" of suburban cities is this we will continue only along the lines so far used by the British—the dropping of millions of propaganda leaflets. Possibly the Germans had something like this in mind years ago when they designed as a "newspaper delivery plane" one of their first high speed paratroopers built in violation of the Versailles Treaty.

✧ However, very few literary writers and commentators have real regrets that the world services over the effect of the writing nations will long be limited to the dropping of pamphlets. The Associated Press has even worked out a schedule of "Wing Times" and "Wings to Bank War Capital"—a not uncommon for the two-thirds of the previously popular as those between these capitals.

✧ A THUNDERBOLT THUNDERBOLT from Michael Field, Long Island, which was to them what the Air Corps would be during an enemy air raid, had to be postponed because of bad weather. There's no telling what may result from this small beginning. It is even possible that nations may now be coming past of the experience of a war by selling television rights to some big

corporation, just to see how the war for peace, lights and darkened planes. The possibilities are said to counterbalance. General stepping up to the microphone to explain that the great advantage being made by his soldiers are due to their sitting of Kinky Kinky



Blindfolded. Poor, or a substantial rainmaker unproven that his glorious victory over the northmen would not have been possible if his troops had been more with Joplin Crepper's Oil.

✧ However, if anything like this does come about, business nature being what it is, we imagine there will still be some common sense along the line—"We wish to thank the Bendix Aircraft Corporation for providing the battle regularly followed over this nation at this time as that the public and the opening credits may see and hear the Lee Louis Bush McHugger fight for the Heavy-Weight Championship of the World."

✧ As we go to press there are two great mysteries which seem to be bothering the newspapers of the country—the location of the German base "Enigma" and the location of the new M.A.C.A. experimental station.



AVIATION for October, 1939

K. L. M.'s First 20 Years

The success story of one of the oldest and longest international airlines—a line that now uses American planes and engines exclusively to fly over the most difficult routes in the world.

By A. A. B. Hartsinck

Assistant New York Representative, K.L.M.

Just after the first World War a group of prominent Dutch bankers, industrialists and shipping men conceived the idea of establishing a Netherlands airline. At about the same time, a young lieutenant in the Netherlands Army, A. F. F. F. F., with a Mr. H. H. H., published a circular letter to the "Vrijheid," Holland's national aviation magazine, announcing the organization of the first Aviation Clubhouse in Amsterdam in 1919. This clubhouse, known as the K.L.M., was an enormous success. A numerous number of aviation friends, together with the exhibitor's bankers and the banking groups. The most important result was the founding, on October 7, 1919, of the "Koninklijke Luchtvaart Maatschappij" (Royal Netherlands Air Line, N.V.), better known all over the

world as "K.L.M." or "Royal Dutch Air Lines, Holland." The first flight from Amsterdam to London was made early in 1920. Mr. F. F. F. was at first appointed administrator and shortly afterwards General Manager of K.L.M., a position which he still holds.

Contrary to the general opinion on this country, K.L.M. is not a government organization, though the Netherlands Government has taken a financial interest, and a subsidy has been voted to K.L.M. since 1927. In 1938 this subsidy was approximately \$305,000. This subsidy can be used only at the end of the fiscal year to reimburse K.L.M.'s operating losses.

May 17, 1920, marked the opening of K.L.M.'s first passenger service to London, a distance of 225 miles



You CAN'T



Beat the DUTCH!

KLM operates one of the finest maintenance bases in the world at Schiphol, Amsterdam's airport. These notes on the overhaul and service shops were written for AVIATION by members of KLM's technical staff at Schiphol.

I. Aircraft Maintenance

According to a Schiphol pre-arranged schedule each airplane is brought into the Schiphol shops for inspection, overhaul and repair. In the event the airplane is in for complete overhaul, any modifications which may have been recommended by the manufacturer are made, thus keeping the equipment quite modern and up to date.

The KLM system is made up largely of two types of services, namely European lines, which cover the countries in Europe only, and the Dutch East Indies Line, which is operated from Amsterdam in Holland to Batavia in Java, a distance of 24000 kilometers. This route is flown each way three times a week using ten

airplanes of the Douglas DC-6 type. The airplanes operated over the European lines are brought in for a periodic inspection every 75 hours. Every 400 hours the same airplanes come in for overhaul.

Overhaul consists of an engine check (every 900 hours), change of propellers and a thorough inspection of all engine and propeller controls. In addition, the airplane structure is partially dismantled, thoroughly inspected and all necessary repairs and replacement made. At this time the instruments are inspected and coated along with the radio which is removed from the airplane and thoroughly tested in the radio shop. Some of these parts are inspected after 300 hours, some, however, after 600 or 900 hours.

The inspection and maintenance of the ten airplanes used on the Holland-

Java line follows. However, there is additional inspection along with repairs and replacements. After each return trip to Batavia, approximately 150 hours, the ship is given an overhaul comparable to the 400 hour overhaul given to the airplanes used on the European lines. The engines are not removed, however, but are completely checked and adjusted.

Propellers are changed after each return trip. In addition, the engines are given a 50 hour inspection at the Batavia end of the line.

There is ample time to make this inspection as the airplane is held in Amsterdam for a period of one week. This will allow two days for the actual maintenance work and one day for ground and flight testing and also for any additional adjustments which are found necessary. During the remain-

ing part of this layover period the airplane is held in reserve.

After these return trips to the Dutch East Indies the engines are removed for complete overhaul and two completely overhauled and tested engines are installed. Of course, the usual inspection and repairs which take place at every 150 hours or one return trip are also made.

In planning an overhaul shop layout it is highly necessary to locate the various overhaul units to the best advantage. This has been done at Schiphol, the main overhaul station for the KLM system. The main

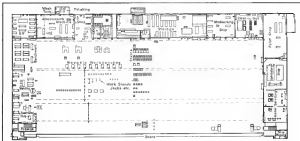


View in Engine Shop (ward K) showing assembly lanes at right.

KLM ENGINE AND PROPELLER OVERHAUL SHOP



Plan of Engine Overhaul Shop at Schiphol. Opposite page shows work in progress.



by motor even when fitted with short open stacks and not with the usual exhaust pipes.

The second-proof, alternative motor is in the center with a bank on each side. The engines can be reached through the front windows. All instruments are placed inside the tubes under the windows, so that one man can reach both the engine and the instruments.

After testing (which varies from 3 to 8 hours) the engines, together with the rear sections, are taken off the bench and subjected to a special inspection. After having been approved, the engine is given to Department G, where the engines are installed in the nose sections. From the Inspection Department the nose sections are sent to Department H, which takes care of the necessary repair work, viz., the welding of cracks in the exhaust manifold of the nose, the replacement of tubing or wiring, and so on. After the installation of the engines in the nose sections they are put on a movable trolley and subjected to a final inspection. Then they are ready for passing to the Plans Department for installation.

The number of engines on K.L.M. routes is as follows:

- 62 Cyclone G-102A
- 1120 hp. take-off rating
- 18 Wright Cyclone F-42
- 600 hp. take-off rating
- 37 Wright Cyclone F-42
- 675 hp. take-off rating
- 34 Wasp T100
- 325 hp. take-off rating
- 7 Jupiter
- 460 hp. take-off rating
- 10 Gyron
- 130 hp. take-off rating

An average of about six engines and about eight propellers is taken in, overhauled per week. Work is done also for other firms. Engines sent on to the Netherlands-India route of K.L.M., Amsterdam-Batavia, are overhauled only on the G-102A type. These are completely overhauled after three or four return flights, corresponding to 240 to 480 hours of service. Engines type G-100A, F-42, and F-42, used on the European and West-Indian lines are overhauled after 600 hours of service. The engines of the Indian route are not subjected to the same long service time as those on the European lines. This is due to the fact that the former engines are operated under more unfavorable circumstances. Moreover the engines of the European lines are inspected daily by the Technical Department at Schiphol, which is impossible for the Amsterdam-Batavia line.



RAED places a highly improved safety rate in K.L.M.'s long increased air routes. In the right, standing left in right typical inspection and service bench face is a bench (left). Back is view in a typical ground station, the installation of the engine. Finally, the result of the well lighted and adequately laid out shop at Schiphol where all planes and ground units require is brought in the overhaul and repair.



Two views of the section not shown by K.L.M. engine. Above: The completed two-blade propeller assembly and control seen between the two drive shafts. Below: Aerial view showing the assembly line and the various aircraft in the shop.



As ground personnel is stationed along the route. On board all planes a mechanic with a full license for planes and engines makes up part of the crew. Flying about six hours per day it is evident that he cannot give too much time for daily inspection of plane and engine, because in the emergency he often takes care of attending and other routine work.

III. Propeller Dep't.

The Propeller Department is shown on the plan (page 25) lower part of the Tower Plant Maintenance shop. Propellers are dismantled and cleaned in the Dismantling Shop, but for inspection, assembly, balancing and adjustment they are sent to the Propeller Department, where about 20 men are employed. In total K.L.M. has about 200 airplanes, all of which are metal airplanes in Europe and also a few of the first aircraft company to use a two-part propellers, constant speed propellers and Hamilton-Standard built "Glynn" type.

Controlable propellers normally are overhauled after 200 hours of service. With the hydraulic propellers, however, overhauls are made after about 600 hours, which is necessary to do six return trips. Amsterdam-Batavia, via about a total distance of more than 100,000 miles.

Propellers are overhauled also for third parties, such as the Dutch Army, Navy, aircraft companies and private owners.

IV. Instrument Dep't.

The repair shop is housed in a large and well lighted building. As a rule all instruments are completely overhauled by K.L.M., as it would take too much time to send them back to the manufacturer. The shop is therefore provided with complete tools and calibrating equipment. The personnel, consisting only of 25 men, is subdivided in various groups, is extremely specialized. To each group is entrusted the upkeep of a special kind of instruments.

Before they leave the maintenance shop the instruments pass a final inspection. Moreover, the instruments in storage are periodically checked. This is especially necessary for instruments with very sensitive bearings, in which are subject to wear. Particular attention is paid to preventing instruments against the varying climatic conditions prevailing in the Amsterdam-Batavia route.



Below: A view of the disassembled propellers assembly department, showing the various parts and components. Below: A view of the Wright Cyclone engine assembly department, showing the engine and its various parts.

AVIATION'S Maintenance Note Book

SCHIPHOL GLIMPSES

Twice within the past two years we have had opportunity to visit ELM's maintenance base at Schiphol. Millions more men everywhere may find valuable pointers from a study of this group of pictures from ELM's shops.



1. A corner of the well lighted, air conditioned instrument shop. Note glass enclosures on lower right.
2. Collecting altitudes against standard pressure scale. The size of the instrument dial is interesting.
3. A Sperryball Sweeney bar giving eye plate a workout.
4. Test setup for checking Cambridge magneto.
5. The engine disassembly department. Note accessibility of tools and other equipment in wall racks.
6. Engine cleaned after disassembly and before inspection.
7. The ELM version of an engine parts rack.
8. One of the assembly lines in the engine packed shop. Note glass partitions between adjacent lines.
9. Even the propeller sections are carefully balanced on this machine before sent to ground and ways.
10. Portable oil pump for use on the servicing apron.
11. A simple and solid type of service stand used at Schiphol.
12. A corner of the propeller packed shop showing units for completed assemblies.
13. Service stand for Douglas tail units.
14. Wright Cyclone engine on portable case motor dolly.
15. The balancing stand for large propellers, with a Hamilton-Standard dynamometer in place.





CAA Demonstrates BLIND LANDINGS

**I.T. and T. Guide Indianapolis Inland to
C.A.A. Specifications, Full-Blown Transmitters
Covering Each Runway in Both Directions**

By Don Fink
Radio Editor of Aviation

THE FIRST ELABORATE blind landing installation ever installed in this country was demonstrated on September 25th to 1953 at the Indianapolis Airport by the Indianapolis Telephone and Telegraph Company, in building the C.A.A. system awarded to them last year. Each of the two long runways at the airport has been fitted with eight transmitters, four for each direction, and the whole system has been put directly under the supervision of the control tower operator.

The meeting for the demonstration brought and practically everybody in the radio division of aviation. A representative of the RTCA met to investigate the system's merits and to recommend its installation in some form of the landing airports of the country. Since their report was favorable, it now seems almost that blind landing equipment will be installed in a sufficient number of airports and put on regular operation so that it may become a part of transport pilot's everyday experience.

The Indianapolis setup was erected according to detailed performance specifications drawn up by the C.A.A. In following these specifications the Indianapolis Telephone Development Company, an I. T. and T. subsidiary,

had in turn to do a real development job. Among the standard requirements of the I. T. and T. engineers are a landline antenna system which is entirely free from vertically polarized waves, and hence free from multiple echoes, lost echoes and the tendency of the landing aircraft to "push" the beam. Another most important achievement was that of meeting the C.A.A. specifications on temperature range. The equipment was to operate passively throughout the range from -40° to +60° Celsius which is a very wide range indeed. Finding better metals, all metal brackets and connectors which would operate at both ends of the range was a job, solved in the instance of the landing marker by employing a more strongly built for marine duty service, and in the case of the landline by fading grease and oils which remained greasy and oily at -40°. Still another noteworthy accomplishment was the receiving antenna in the plane, which like the transmitting system, is receptive to horizontally polarized waves only, and which de-

plays equal sensitivity in all directions. The antenna receives both the 309.9 Mc. landline signals and the 55.9 Mc. glide-path signals simultaneously and separates them in a newly-designed filter structure. Finally, the achievement of a quasi-straight-line glide path, which is straight from an altitude of 680 feet down to the airport surface (but displays a bend above 600 feet) distinguishes this equipment from all its predecessors.

The Four Basic Transmitters

The basic landing system consists of four transmitters, an outer marker transmitter which sends up a 75 Mc. fan two miles from the airport, an inner marker which sends up a 75 Mc. fan at the edge of the airport, the glide path transmitter which establishes the 309.9 Mc. equivalent course of signal on which the normal guidance of the plane is based, and the landline which sends the two 55.9 Mc. modulated waves which establish the horizontal guidance. The four transmitters have been duplicated four times, one set for each end of each runway. All are completely mounted, and the installation of the transmitters

led directly to the control tower. The control tower operator can select, at the turn of a switch, which group of four transmitters is desired or deselected by the wind direction. As shown in the illustration, the airport map is laid on the operator table, and fixed with lights which show the direction of approach and its position in operation.

The Marker Transmitters

The inner and outer marker transmitters are identical except for the modulation used. The inner marker is keyed 6 times per second at 1380 cps while the outer is keyed twice per second at 600 cps. Both transmitters employ 500 beam power tubes in the r-f section to develop five watts output at 75 Mc. from a crystal frequency of 936.7 kc. The transmitter equipment is mounted in metal units, containing radio and audio controls, power supply, modulator, keying apparatus and monitor. The units put out from the aluminum-painted housings and have readily removed doors so that servicing is made as simple as possible. In the same housing are the 250-voltage regulator, and the telephone equipment for communicating with the control tower when adjustments are made. The monitor consists of a small dial which takes a

part of the output of the transmitter and rectifies it. The d-c component passes through a meter on the face of the transmitter and a lead for taking measurements, etc. The a-c component passes by telephone wire to sound tower for indicating meters and lamps.

The five-type antennas associated with the marker transmitters are of the conventional double half-wave position mounted one-eighty were above a ground screen which in turn is one-eighth wave above ground surface.

Reception of the marker signals is accomplished in the standard 75-Mc. marker receiver which gives both audio and visual indication (via earphones and lamps) of the passage of the plane through the fan of signal. The display consists of a meter indicator at a second or two only, but the distinctive modulation is unmistakable, and the edges of the signal are adequately sharp.

The Landline Transmitter

The landline transmitter is located about 1800 feet beyond the end of the runway, at the end first approached by the plane. It is a 300-watt 138.6 Mc. model which employs a 450V17 beam crystal and three multiplier stages. The intermediate power amplifier uses 100E12 tubes, while the final uses 260E11's. The whole gear power supply control equipment and all fits in a cabinet only 70 inches high and 20 inches wide. Installed in the tower is a transmitter monitor which operates in conjunction with a signal receiver situated in the field in front of the transmitter house.

The output of this transmitter is fed to a very ingenious dividing network which splits the signal into two paths. Out of these leads to a mechanical modulator of 90 cps frequency, the other is a modulator driven from the same shaft, of 150 cps frequency. After modulation the signals are applied in the speed bands usually polarized antennas previously mentioned, which establish the required course along the runway and do so without radiating vertically polarized signals.

The mechanical modulator performs modulation not by a constant resistance, as was true of several previously announced systems, but by a capacitance-varying arrangement which has no moving parts. The modulated lines are sent through the antenna system, and great accuracy has been paid in transforming from single-ended to balanced currents in the two modulation frequency systems.

(Turn to page 32)



Above, landline transmitter and monitor. Below, receiving antenna on ILL landing



AVIATION
October, 1953
31

BENDIX ROUND UP

Trip to Baltimore Plant Reveals New Equipment, Reviews Accomplishments

By Don Fink

Radio Editor of *Aircraft*

The position of the Bendix group within the aircraft radio field has traditionally been one of volume production, the highest quality and proportionately high prices. It did not surprise us to hear, for example, that our company's receiver in the line was struggling around under a list price of \$1000, use that it compares in size to the recent best-of-their-kind has been sold to organizations, foreign governments, and who not only could afford to pay the price but who considered the equipment well worth it. Such a reaction is of course delusive optimism—few would challenge the claim that it is the finest that can be built—but it is not for an amateur radio. Bendix is continuing to produce such high-priced equipment in small lots, but they are also expanding a line of moderately priced equipment suitable for small airlines, operations and for maintenance in private flying shops. The latter trend seemed to us to be the outstanding new note in Bendix engineering and production.

33 watts, 2 channels, 24 pounds

No better example of this trend could be found than the new TA-6 transmitter which is put together to roll through production, the aircraft line in the Bendix line. It is a simple and light-weight transmitter, built to have more power than is offered by the usual pair of 6L6's, and to offer unusual duplicity of operation from the pilot's point of view. The equipment offers two crystal-controlled channels which are switched by a remotely controlled relay, and which may carry any frequency in the range from 250 to 1500 kc. The power output, rated at "not less than 33 watts" into a 50 ohm resistive load, is actually around twenty watts—each in circuit for some precise planes, and for easy commercial operation on 400. Four tubes are used: a 6L6 oscillator, an RF beam-power P-1 amplifier, modulated by two 6X5's in class A3 push-pull. Advantage has been taken of the extraordinary power sensitivity of the 6X5's to operate

On the last day of August your radio editor and his boss dropped in at Baltimore to have a lookover at Bendix Radio Corporation. In the course of the day we gained new insight in the methods and equipment of one of the outstanding key organizations in the aircraft radio business. Here we were able to examine the development of several brand new pieces of Bendix equipment and to review in detail other apparatus previously mentioned.

directly with the carbon microphone in the grid of the modulator tubes, with 100 per cent modulation available at that. The power output is 30.5 watts, 15 amperes at 82.5 volts, with 24 volt operation optional.

The TA-6 is intended for straight unmodulated CW (maximum keying speed 20 words per minute) or phone (in phone, the audio characteristic is full within plus or minus 2 db. from 200 to 2000 cps, and the distortion at 1600 cps is 7.5 per cent, at 80 per cent modulation. The weight of the transmitter proper is 24 pounds, 5 ounces. Complete with all accessories (remote control unit, junction box, cables, microphone, key, tuning meter and antenna terminals) the weight is about 35 pounds.

The special mechanical and electrical features of the transmitter include: for integral assurance of the power supply transformer in the transmitter cabinet, and the use of a modified beam oscillator which allows, with but one grid circuit, the use of the crystal fundamental at harmonic frequencies. The antenna tuning coil is the newly popular variable-inductance type, developed by Fred Waco and widely used in radio work outside the aircraft field. Harmonic balance is built into the microphone transformer, and volume limiter action is incorporated to prevent over-modulation.

The remote control panel controls jacks for microphone and key, an on-off switch and a selector for 24 frequency change switch, and a switch for switching CW or phone. A meter jack for tuning is provided in the back of the transmitter cabinet, together with a switch for selecting plate or grid current readings. Antenna current can be read on an external

dc meter, fed from a thermocouple mounted within the transmitter, and removable (it looks like a 6150 duodec) when not desired. The meter may be connected to the thermocouple by leads as long as 30 feet, which is a distinct advantage in installation.

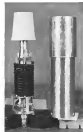
RA-15, Remote Control with a Capable C

An equally new item at the receiver line is the RA-15, the first receiver of which are just coming through the line. Briefly stated, the RA-15 is an 8-tube, 4-band receiver, unmodulated operation, for private planes, and as an auxiliary receiver for long-haul transport use. In our opinion, a very conservative one, for the receiver has plenty of what it takes. The bands cover ranges from 150 kc. to 10,000 kc. in four bands, continuous except for a 500 kc. gap from 1100 to 2600 kc. As in the TA-6 transmitter, the power supply depends on the 6X5-100 beam tube in back into the cabinet, and a very clever switching has been evolved in aerial couplings for vibration-free, ruggedized, built-in the inclusion of aerial coils in all low-level stages. There was a time when aerial couplings in aircraft radio tubes in their vertical positions in all equipment. But that day is past. The circuit includes an r-f stage, mixer, three i-f stages, and a detector—single unit of aerial coils, and two glass audio output tubes.

Switching between bands is accomplished by an electrical motor drive. The motor, a very 110-volt dc motor, built to suit the chassis itself, is mounted directly behind the antenna i-f and condenser coil compartment. The motor drives a shaft on which are



TA-6 receiver, typical light-weight equipment



Antenna couplings and control panel for the RA-15 receiver

mounted conventional plate-type rotary switches. Auxiliary contacts on these switches bring the motor to a stop when the required switch points have been found. The control of the motor circuit is a simple four-point selector in the remote control panel.

The knob on this control shaft is used over the dual type and merely gives four frames which apply to the band actually in use. We have added, as is complete and simple a remote band switching system. Tuning is accomplished by the conventional flexible shaft drive, but which actually has been carefully checked. Frequency readability consistently reads within one per cent.

A low-frequency oscillator for CW reception is included as standard equipment. This oscillator is selected by a knob on the control panel, which also selects the automatic from the manual volume control. Two crystals may be employed on the heterodyne oscillator for tuning to either of two frequencies in the upper two bands quickly and accurately. The overall sensitivity is approximately 4 microvolts for a 30 milliwatt input at 440-1 power signal-to-noise ratio. A high power output of 500 milliwatts is available on each of two audio channels.

The RA-15 receiver has been designed for use as an unmodulated receiver. When in use, an auxiliary key loop receiver is attached to the front face of the receiver. This relay provides quick switching from regular listen to loop. The loop proper is of the low-pass design, 9 inches in diameter, mounted in a suitable stream lined casing. A remote antenna control is available for making the loop. On band 1, from 150-800 kc. the range ratio is better than 10:000 to 1, and on band 2000 to 1100 kc. the ratio is 5000 to 1. These high ratios are especially valuable when the frequency-tuning switch is used. Selectivity at 60 db down varies from 22 to 20 kc. from the low to the high end of the tuning range. The receiver

operates weighs 32 pounds, 8 ounces. Fully installed the weight is about 55 pounds. The key unit is an auxiliary add about six pounds.

Information on the Static Disruptor

The anti-static equipment developed jointly by United Airlines and Bendix has already received wide publicity, but the details of its construction in commercial form are not widely known. United Airlines and Northwest Airlines have made commercial installations of the equipment and West Central Airlines have made an experimental installation (Bendix) earphones have been ordered by the Navy, military air force, including the British, Belgian, and Swedish. The present focus of the anti-static equipment is shown in the accompanying photograph.

The essential elements of the anti-static circuit of a small paper window (which is located from the end of the plate by a plunger) is a fine-wire length of stainless steel flexible wire, 5-440 lb. in diameter, stretched to the coil, and finally a five-foot length of resistance condenser, rubber covered, which connects the steel wire to the coil of the slip. When static electricity builds up, the slip operates a switch in the condenser which causes current through a small flexible wire in the condenser. When this wire is severed by the action of the current, the plunger is released, breaks through a paper covering, as the tail of the slip, thus releasing the steel wire in the condenser and causing the wire to be dragged out of the coil. The steel wire, having the smallest radius of curvature at any portion of the slip's surface, concentrates and liberates the static charge, while the resistance condenser, being of large diameter and rubber covered, does not do so. The current discharges in a flash confined to a space considerably behind the slip, where its effectiveness in protecting the aircraft is well demonstrated. The presence of the resistance (roughly 200,000 ohms) in series with the discharge wire tends to prevent an oscillatory type of discharge which is particularly conducive to noise.

The result is that static noise is much reduced when earphones are required. No means of re-winding the condenser are provided, hence when the plate is locked, there is a good chance that the wire will come usually will not be lost or damaged. However, the assembly is quickly and cheaply replaced.

(Turn to page 41)

TETHERING the Airplane

The rapidly increasing number of private airplanes has resulted in a serious shortage of hangar space. With winter winds approaching much damage can be averted by accurate knowledge of the principles involved in staking down aircraft.

Part I

By Walter C. Clayton
Consultant, Aero Engineers Unlimited

WIND STORMS have long been the cause of considerable losses to aircraft. A good number of airplanes, particularly light planes, are now being tied to the ground, being towed only while being repaired. Such aircraft have suffered badly from wind stress. An operator should bear in mind that he and the other operators of aircraft ultimately pay for all of the wind stress losses to Civil Aircraft. The uninsured operator pays the entire bill at the time of loss, while the insured operator distributes his loss among other insured operators through the medium of the insurance company. Insured losses inevitably result in increased insurance premiums. On the other hand, a reduction in losses will reflect loss at lower premiums.

For want of a better term the writer will refer to tying of aircraft to the ground as "tethering," a term borrowed from the "baiter & bunny days."

It is not the purpose of this article to discuss the economic aspect of whether it is cheaper to tether an airplane out in the open and take the risk of resulting wind storm losses or to provide hangar accommodations to safeguard the airplane. This is a matter which the operator must decide for himself. Even if there were provisions for hangaring all aircraft there would be times when it would prove necessary occasionally to leave an airplane out in the open. When adequate hangar facilities are not available, the operator must make the best of the situation.

Wind storm losses may be classified in four groups:

1. Aircraft that are blown away as the result of not being adequately tethered.

2. Aircraft that are damaged by the wind while tethered.

3. Aircraft that are damaged by objects or sand buried against them by the wind.

4. Aircraft that are damaged due to collapse of fusages either through faulty construction or poor maintenance.

The article will deal primarily with the first two items. The following discussion is concerned with the engineering aspect of the problem from a mechanical standpoint and with recommendations to avoid wind storm losses.

As an airplane achieves its lift because of the velocity of the air relative to that of the airplane, it is obvious that the forces acting on the plane will be increased with any increase in the velocity of the wind. All other factors remaining equal, the lift on the airplane increases in the square of the velocity. Therefore, if the velocity of the wind is doubled, the lift force on the airplane becomes four times as great while if it is tripled the lift becomes nine times as great.

While the lift of an airplane varies as the square of the velocity, it also varies directly with the angle of attack. Airplanes having the conventional type of leading edge with the two wheels in front and a tail wheel or tail skid resting on the ground will have their wings at nearly the angle of maximum lift. In other words, an airplane facing into the wind at its stalling speed is in the position to get approximately the maximum amount of lift out of the wind. Obviously if the wind velocity is strong enough, the airplane will

have a tendency to fly as a kite being increased by the tethering ropes.

There has been much talk concerning the effect of the proximity of the airplane to the ground on the lift. In N.A.C.A. Technical Note 765 "Wind Tunnel Investigation of Ground Effect on Wing Flaps," the following conclusions were given:

"The approach of the ground had almost no effect on the maximum lift of the plane wings but reduced the maximum wing coefficient of the wing equipped with slots or slatted flaps."

While the ground had virtually no effect on maximum lift, it did materially reduce the induced drag "Ground effect" was defined by Professor Allen H. Kussel as the "upward flow of air from the wing surface which causes the air to be deflected upwards and outwards in the form of a wing wake."

There is a factor which should also be kept in mind, namely that the airplane as tethered, will be in a very light condition in that there will be no passengers and little or no fuel, all as luggage. Therefore the airplane may weigh not more than approximately 60 per cent of its gross weight. Because of this, the wind velocity at which the airplane will tend to fly as a kite is reduced. This wind velocity is equal to the square root of the ratio of the empty weight to the gross weight times the fully loaded landing speed of the airplane. Assuming that an airplane is tethered out, weighed 60 per cent of its gross weight, the wind velocity at which it would fly as a kite would be approximately 77 per cent of the stalling speed of the airplane. That is to say, a light plane having a stalling speed when fully loaded of 40 miles per hour would tend to fly as a kite at 31 miles per

hour. And airplanes having landing speed of 50, 60 and 70 miles per hour respectively would tend to fly as kites at 39, 46 and 54 miles per hour respectively. From the above it is seen that a light plane improperly tethered might readily get into difficulties in a high wind.

There are three positions available of tethering or restraining the lift on the wings of an airplane while tethered. The first alternative is to place the airplane in a substantially level attitude such that the wings are at approximately their angle of zero lift. This will be accomplished if the tail is at a little higher than that of several flights (See Figures 1 and 2). The angle of zero lift for conventional airfoils varies between zero and minus six degrees. Zero being for symmetrical airfoils and minus six degrees for fairly highly cambered airfoils. If the tail of the airplane is raised several degrees above the normal level three positions, the lift on the wings will be negligible.

The second alternative is to tether the airplane in the three point attitude, broken into the wind and with "equalizer boards" attached to the upper surface of each wing, a short distance back from the leading edge. (See Fig. 3) "Equalizer boards" will destroy most of the lift of the wing, thereby making it possible to safely tether the airplane in the three point attitude. The recovered drag will not present any difficulty provided that the wheels are adequately braked. The equalizer should extend over most of the span. Usually having a bracket of approximately 5 per cent to 10 per cent of the wing chord should be satisfactory.

The third alternative is to tether the airplane with the tail pointed into the wind. (See Fig. 4) This procedure has the merit that the wind forces on the wings will act downward rather than upward because the ailerons will have a difficult negative angle of attack relative to the wind. This is a rather simple expedient but has a number of disadvantages. An aileron being acted upon by the air has a high peak pressure allowed on its leading edge dropping off to zero at the trailing edge. In the conventional wing the front spar and the ailerons because the front spar and leading edge of the wing is dropped in order to give high leading edge pressure. The ailerons adjacent to the trailing edge of the wing, on the other hand, is relatively flatter. When an airplane is "tethered" into the wind the trailing

(To be continued)

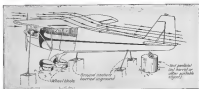


Fig. 1. Airplane tethered in horizontal position, facing into the wind with tail on a pedestal.

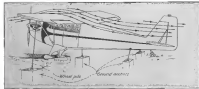


Fig. 2. Tethered in horizontal position facing into the wind with wheels in the ground.



Fig. 3. Airplane tethered in "three point" position, facing into the wind with "equalizer boards" attached on upper surface of wing near leading edge, causes tailskid to break off lift.

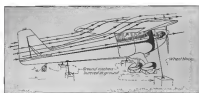


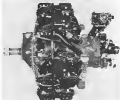
Fig. 4. Tethered in "three point" position tethered into the wind.

WRIGHT 14 CYCLONE

NOW, FOR THE FIRST TIME, there is available for engine sale, and with the accompanying owner information is to enter there is inside the engine that goes out of the power. This engine is rated at 1550 horse power at sea level but with a few alterations 1550 horse power was obtained for takeoff with 1350 horse power available for normal operation. But with the exception of the crankcase and crankshaft, the basic design of the new engine remains unchanged from the well-known single-row Cyclone.

The Double-Row Cyclone is a supercharged model of 14 cylinders, having a total displacement of 2950 cubic inches. The cylinder bore is the standard 4.125 inches of the single-row cyclone but the stroke is slightly shorter, being 5.112 inches instead of 4.937 inches. The overall diameter of 35 inches is the same as that of previous Cyclones, but due to the additional row of cylinders is little more than a foot longer, which includes a streamlined pump for the mixture between the carburetor and supercharger.

One of the developments that has come out of propeller vibration studies conducted on the engine and incorporated, was a 7th order damper on the



Shown to the left and on the left is the side view of the Wright Double-Row Cyclone engine as it would be mounted on an aircraft.

front crank shaft and a 3d order damper on the rear shaft, a combination which has materially reduced propeller shock stresses. In addition to these, both compression of the 14th crankshaft on the Wright Dynamic Damper to materialize internal vibrations in the engine as well as from the propeller.

The cylinders follow the usual conventional layout with two exhaust ports on each cylinder and two intake ports on the rear of each cylinder, they alternate sides between the front and rear cylinder banks. Valves are inclined to the outside of the cylinder at an angle to permit a hemispherical combustion chamber. The inside of the cylinder barrel is shielded and the cooling fins on the outside are radiated. The crankcase is generally sealed to prevent oil leaks except that the main service contains of three aluminum forgings, divided as shown through the center

of the cylinder locations of each bank. These combined main sections contain the three main crankshaft roller bearings and support the front and rear main drive gear assemblies. The rear section, machined from an aluminum alloy casting, holds the propeller thrust ball bearing and houses the propeller speed reduction gear which are furnished optionally to give 14 to 9 or 3 to 2 reduction ratios.

The supercharger belt housing has been enlarged to provide outlets for the 14 pipes to the cylinder intake ports. In addition to serving as the front wall of the diffuser chamber, this section is provided with seven mounting bosses for use with rubber mounting blocks. The accessory drive section forms a mounting for the distributor plate, holds the propeller and fan capacitor drive shafts, and houses the belt-drive Cam oil filter, two gun synchronizer drives, fuel pump and two tachometer drives. The dynamometer is mounted on the section, which also houses the indu-

tion passages to the propeller. The rear drive plate for mounting of the accessories is a separate alloy casting which is bolted to the rear of the main crankcase.

In order to make use of a light pipe master mounting rods the crankshaft is made in three parts. These are clamped together in the sec-



Three combined main sections showing the mounting of the intermediate main drive gear and the rear ring.

tion as the two parts of the intermediate crankshaft. The intermediate crankshaft is bolted together with the main section consisting of the two crankpins at 180 degrees from each other, with a journal for the intermediate roller bearing. The roller shaft is bolted through to provide passage for the control of supply and each crankpin is drilled for two oil outlets to the bearing, which makes an oil clearing mechanism of the crankpin chamber. The rear of the crankshaft has an internally applied extension for mounting of the accessory drive and master shaft.

The propeller shaft is machined from an alloy steel forging and is bolted through in length with 30 splines (5 A.E.) at the end. It is supported by two bearings mounted at the front of the crankshaft. The rear of the propeller shaft is fitted with a set screw adjuster, each for supporting one of the piston rods in the propeller speed reduction system. The planetary reduction gear, of which three pinions form a gear, consists of a large, left-handed, ring gear with teeth on the internal rim, which drives the propeller shaft pinions around the stationary gear pin, held in the middle of the main section.

The one-piece master rods, machined from alloy steel forgings, differ in appearance from single-row rods

mainly in that they each accommodate only six articulated rods instead of eight. The shaft is an I.E. section, the flanges of which are a combination of the flanges at the shoulder at the crankpin end. The extended rods are "I" section with leadings pinned in at the ends open end.

The piston of the engine are full crank type aluminum alloy forgings, the heads being strengthened and cooled internally by ribbing. There are five piston ring grooves used, four above the piston pin and one in the skirt. A single compression ring fits in each of the three grooves nearest the top of the piston, with two rings of control rings in the fourth groove and an oil scraper ring in the bottom groove.

The cyclone 14 has two valve-camshaft valves, each of which is supported on journals mounted on the front and rear of the main crankcase. The main cam drives through intermediate gears from two gears, one integral with the propeller reduction drive gear, and the other attached to the rear of the crankshaft. The main camshaft the valves by a push-rod and rocker arm system which is incorporated in the piston guide.

The valves are in solid aluminum. The intake valve is solid and the exhaust valve is hollow partially filled with sodium. The supercharger uses a single impeller driven by intermediate gears from the accessory drive shaft. The drive ratio is 7.0 to 1, 7.4 to 1, or 7.8 to 1 and 10.0 to 1, depending on the engine model.

The lubrication system is the full pressure type in all sections except the cylinder walls and piston pins, which are lubricated by oil sprayed from the main crankshaft bearings. A single line from the rear of the engine contains both the pressure and scavenger pumps. All engine oil drains to a sump at the bottom of the engine, directly below the lower front cylinder, where it is removed by the scavenger pump and returned to the external oil supply.

No-lube lubrication is provided for by a large Chandler-Gerron type carburetor injection is supplied by two Bennett injectors.

It may be seen from the above description that the Double-Row Cyclone 14 cannot be considered as a new engine except when taken in its whole. However, being so close to design to the single-row Cyclone has an advantage in performance response which should prove its worth in commercial and military use.



ABOVE: Internal parts of the engine are shown in detail of pistons, cylinders, with the exception of the Double-Row crankshaft and the additional main rods to maintain the volume of the new cylinders. BELOW: The bearing section from case is supercharger gear made of aluminum alloy; the rear section mounted over case is supercharger. This crankcase is in three sections, and the main drive section is bolted to intermediate section which is bolted to the crankcase.



GIANT GULL: Shuttling U.S. fleet from tip to tip, the wings of this new Navy Patrol plane easily stretch the size of the sea gull.

MARTIN

XPBM-1 PATROL BOMBER

For the Navy!

TO EXPAND the horizons of our high seas fleets . . . to extend the long arm of our National defense . . . to serve as a swift and potent guardian of our far-flung coast lines . . . this new Martin-built Patrol Bomber has been designed for the Navy. * * * As the first airplane for which a small-scale, man-carrying model was ever built and flown to predetermine the performance of a full-sized ship, this latest Martin achievement—the "362"—writes a new chapter into the annals of aeronautical science!

THE GLENN L. MARTIN COMPANY, BALTIMORE, MARYLAND

Builders of Dependable Aircraft Since 1919



MARTIN

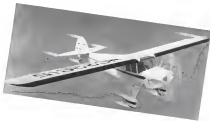
DAVID and COLLATIN: Built before construction of the big ship was even begun, the miniature model was actually flown to ascertain, in advance, the water-maneuvering, take-off and landing characteristics of the full-sized ship. Upon completion, the big plane duplicated almost exactly every characteristic demonstrated by the flying-model prototype!



ROCKET TAIL: Patented by the Martin launching company, Middle River, Md., the graceful, sweeping line of the XPBM-1 adds to weight of 187½ tons.



DUPLIC SCOPE: It takes a full-scale prototype of this ship, long, unobstructed, flat, the crew could possibly conduct operations on any kind of ship.



TAYLORCRAFT for 1940

You wouldn't know the 1940 Taylorcraft if you looked at it head-on. The new nose cooling represents a definite step forward. It covers the engine completely and encloses a new type of single under-skin exhaust that reduces the total noise to almost nothing beyond a pleasant purr.

Another feature that will appeal to fixed base operators and private owners alike is the steerable wheel

or skid, steered. With it you can turn dual wheel, dual stick, or wheel and stick control in the same airplane.

The cabin has been made more comfortable with wide "dual-height" seats and radiant heatlines to provide for the use of unit-type gas-turbine. Engineered wood or lightweight aluminum are optional and a four-wheel is standard equipment. Vision through the big glass windows.

Wing construction includes the use of ribs and leading edges of Macmillan and spruce spars with three-bayings at points of high loading. Portage is of conventional welded steel tube construction.

Power plant options include 50, 55, and 65 hp. Lycomings, 50 and 65 hp. Continental, and 50 and 60 hp. Franklin engines. Standard equipment includes dual wheel control, turn-and-slip indicator, altimeter, oil temperature and pressure gauges, sound proofing, electric plastic control wheel shafts, electric windshield, adjustable window, and fuel. Available as extra equipment are brakes and tail wheel, brakes with struts, tail skid, variable tail wheel, press, reversible wheel skid-wheel control, dual sparkers, compass, extra door and window, cabin heater, pressure leather upholstery, navigation lights and battery, extra 6 gallon gas tank and pump.



Sales and Service Men: Sales Manager, Fred Taylor, and Vice President, Dr. J. W. Taylor.

Specifications furnished by the manufacturer include:

Wing span 36 ft.
Length 27 ft.
Weight empty 600 lb.
Gross weight 1150 lb.
Maximum speed 155 mph
Cruising speed 95 mph
Landing speed 40 mph
Range 250 mi.
Absolute ceiling 10,000 ft.

ATTENTION
October 1939
45

ACROSS THE SKIES THE NATIONS
DRAW TOGETHER



THEY WHO LOOK TO THE
EUROPEAN AIRCRAFT MARKET
LOOK TO

Helliwells
OF WALSALL, AIRPORT, ENGLAND.

THE LARGEST AIRCRAFT COMPONENT
MANUFACTURERS IN EUROPE
SUPPLYING ALL THE LEADING
AIRCRAFT MANUFACTURERS



The REARWIN CLOUDSTER

By R. W. Hummel

Chief Engineer releases design details of new model.

DESIGNERS with an eye to a long range production program the recently approved Bessner's Cloudster series is now in full service production. Two models of the Cloudster are now available, Models 3000 and 3025, the former being powered by the Ken-Royce 37 (90 h.p. at 2250 r.p.m.) and the latter by the Ken-Royce 27 (120 h.p. at 2225 r.p.m.) These models are an entirely new development and are Bessner's first venture into the ultra-light field. The wings are of the semi-can, lever type (built by Van Vleet). The wing structure employs spruce spars,

spine ribs, metal leading edges, with single steel drag truss and tie rods. A single jury strut of the internal tie type is employed. The ailerons are of the Kestrel type, with aileron cable and aluminum alloy rib construction are completely static and dynamically balanced by their own structural weight. Ball bearing hinges are used at the aileron hinges.

The empennage structure is of welded chrome molybdenum steel. Tailfeather spars and steel ribbed ribs are welded and all surfaces are fabric covered. The structure is statically and dynamically balanced and is

equipped with a dual steering tab, controllable from the cabin by means of a Bessner type 300 mechanism. Full or remote landing legs are installed at all elevator and rudder hinge joints.

The landing gear is of the axle strut type with 7 inch vertical rise. The landing gear beam is constructed of heat treated chrome molybdenum steel. Goodyear 5 inch No. 343530 wheels are installed with cushioned landing. Steel brake pedals are actuated from the pilot's seat.

The tail wheel is a Goodyear 8 inch by 7 1/2 inch streamlined type mounted on a full travel shock absorber. The full travel tail wheel unit may be locked in neutral from the cabin at the will of the pilot. Suitable tail wheel is optional. Provision has been made for making of floats or skis.

The fuselage is a fabric covered strut type structure of chrome molybdenum steel tube. Provision has been made for eight color film of luggage. Army standards for control stick and rudder pedal location have been closely followed. Dual sticks are standard and are adjustable in the fore and aft

(Continued on page 11)

TROPICAL OR TRANSATLANTIC



..the Verdict is the Same!

When Pan American Airways' big Clippers don out of the base located for London and London, they represent more accumulated experience with long-range flight than has been obtained up to any other aircraft in the world.

This experience shows that operating where salt water, heat, and high humidity are all around environmental conditions for which Pan American knows the answer. The Clippers, in the way of material, construction method, and maintenance procedures, are built to last.

The Clippers, like other Pan American equipment, are American-built, constructed of Alcoa Aluminum Alloy. Pan American's Flying Scots, which have in battle as much ruggedness as the capital invested in them, operate 5,000 hours a year and upward.

This ships as do because they don't suffer appreciable from the same unfavorable operating conditions which they must encounter. The corrosion problem has been minimized because the Aluminum Alloy used are made, specified, and applied in accordance with principles developed by years of careful study. These

principles have grown out of research in which Pan American's engineers, aircraft builders, U. S. Government agencies, and the laboratories and equipment of Aluminum Company of America have all participated. They include the control of heat treatment, the use of stress resistant aluminum, the application of electrolytic methods of dissolving metals, adequate provision for drainage, and the development of satisfactory coating materials and products.

Alcoa experts have equipped stations for study of resistance to corrosion in varied environments. They work closely with aircraft builders and operators in order to help specify products. Whether Alcoa Aluminum Alloy is used in tropical or transitional climates, or in a dry-desert environment, the same background of study makes them dependable.

For instance, the structural strength of the wings is not the greatest problem at hand. Thus Alcoa Aluminum Alloy is set up to serve the aircraft industry in a way that goes much beyond the usual. Alcoa Aluminum Alloy is used in the construction of the 2182 Giff Building, Pittsburgh, Pennsylvania.



Heavy-duty Alcoa Aluminum Alloy landing gear of the P-40 Warhawk, built by Lockheed.



Alcoa Aluminum Alloy is used in the construction of the 2182 Giff Building, Pittsburgh, Pennsylvania.

Like the Bessner series has single main, shoulder and leg room. Below: Landing gear wheel increases all inches and shock absorber travel in 7 inches.



ALCOA ALUMINUM

AVIATION

Circle 1129

STAINLESS STEEL in Military Aircraft



This shows for a B-25 bomber plane of the type shown at the right is a light, strong structure of stainless steel.



Stainless steel provides flame break screens with smooth, corrosion-resistant surfaces which resist the wear of hot moving projectiles.



Corrosion-resistant interiors with the operation of these rotating steel turbo-machine shafts between the hot-draw and cool-draw sections.

DISPOSABLE and non-disposable military aircraft find stainless steel an ideal material for its increasing number of applications. A few new applications already common on military planes are illustrated. Consider these four inherent advantages of stainless steel and what they mean to you:

1. **Excellent Strength-Weight Ratio**—compare favorably with other commonly used materials. *Result:* Strength with light weight, greater fuel capacity, longer cruising range.
2. **Easy Fabrication**—by modern hot-rolled welding processes. *Result:* Faster production, smoother surfaces, less drag, better speed.
3. **Common Resistance**—immune to atmospheric corrosion. *Result:* No painting, better protection, less maintenance. *Result:* Smooth finish, light weight, less drag.
4. **Strength at High Temperatures**—up to 1650 deg. F. *Result:* Burns hot, survives stress and strain, longer life, increased dependability. *Result:* Greater safety.

We do not make steel but for over thirty years we have produced "Disposacut" ferro-alloys used in making steel. The fact of data on stainless and other alloy steels that accumulated until the weaknesses of our materials are available without obligation. A request on your letterhead will issue the book "Stainless Steel in Aircraft," which describes fully the advantages of this versatile metal in the aircraft industry. **Electro Metallurgical Company, Unit of Union Carbide and Graphite Corporation, 30 East 43rd Street, New York, N. Y.** or **Canadian Electro Metallurgical Company of Canada, Ltd., Wexford, Ontario.**

"Disposacut" is a registered trademark of Electro Metallurgical Company.

Electromet
Ferro-Alloys & Metals

Bendix Round Up

(Continued from page 35)

An interesting fact about the manufacture of the assembly lies in the construction of the rubber-covered resistor conductor. This is a length of cotton tape or cord, which has been thoroughly impregnated in carbon to give it the desired resistance (300,000 ohms plus or minus 25 per cent), and then rubberized. The resulting conductor not only has the desired resistance but it maintains the proper value by virtue of the rubber covering. Furthermore the conductor is highly flexible and strong, and hence able to resist the whipping action, which occurs when the assembly is trailing from the ship. The standard control panel for the electronic equipment is shown in the illustration. It contains facilities for two cathode ray oscilloscopes as controlled by a single switch normally in neutral position. When thrown upward, under the guard, the switch connects lamps to a modulator circuit which reveals whether the cathode has been released or is on and ready for release. When the switch is thrown downward, contact is made with the filament wire previously mentioned and the cathode is released.

Bendix Equipment Around the World...The TA-2

The equipment just described has not yet been widely distributed, because it is so new that orders have not yet been filled. However, the distribution of some of the standard equipment on the market for a year or more is very impressive. Perhaps the outstanding item is the TA-2 transmitter, a 100-watt vacuum 8-band channels. This transmitter was used by Howard Hughes in his round-the-world flight, and carried by Louis Ellsworth to the South Pole. It is standard equipment on the Dutch KLM and KNILG lines flying the routes from Holland to Java and the West Indies. The Pukin LIT and Conradi-Clark CJA have by them across Europe. The American Export steam ship *El Comodoro* (1937) uses the TA-2, and last June accompanied in maintaining contact consistently with New York while at anchor in European waters. Transatlantic and Northwest Airlines use the TA-2 as standard equipment. To give such acceptance, the transmitter must be

proven. The reader can judge for himself from the following description of it.

The basic lineup of the TA-2 includes an 800 crystal oscillator, an 800 buffer intermediate amplifier, and an 800 final π -4 amplifier. The modulation system includes an 800 crystal feeding a pair of 800 triodes in class B push-pull. The output of the modulator stage feeds a transformer with two secondaries, one of which models into the plate, the other the screen of the 800 final π -4 amplifier. The power rating is 100 watts CW or 200 CW and 75 watts on modulated CW or phase, into a 20-ohm load. Modulation is 100 per cent and available, and covers when one volt of signal is applied across the microphone input terminals. Distortion is less than 10 per cent at 85 per cent modulation, at 400 cps, and the frequency response is plus or minus 2 db from 400 to 2000 cps. The attenuation of frequencies below 400 cps is purposely introduced to reduce the effect of noise and static noise.

The π -4 arrangement has in many ways unique. The transmitter contains eight crystals, which may have any frequency from 2000 to 15,000 kc. (range of 36 mc. CW apply in frequency from 300 to 400 kc.). The tuned circuit associated with each of the eight channels are mounted on rotating ferris. (See accompanying photograph for a view of the ferris for the final amplifier tank circuit). These ferris are mounted on a single drive shaft which extends from front to back of the transmitter, and which is driven by a small d-c motor mounted on the front of the case. This motor is operated from the remote control panel. In event of failure of the motor, a hand crank is provided on the rear mechanism so that switching may be accomplished manually. The motor is reversible and automatically turns in the proper direction to reach the desired channel position in the least amount of time. Switching from any channel to any other is accomplished in less than five seconds.

Adjustment of the plate tank circuit of the π -4 final amplifier is accomplished by rotating the tank coil to its own axis. A small buffer oscillator rides on the wire tank and moves along the coil as the coil is rotated, and thus induces more or less of the inductance in the circuit. This is an extremely simple, a fact-proof method of obtaining a flexible and stable tuning adjustment. The antenna loading provisions depend on the Disposacut to be used in the transmitter. A separate antenna loading unit is available

(weight 25 pounds) for use on the lower frequencies. The output current may be adjusted to match antenna as well as slightly off-constant trailing antenna.

The power supply requirements are fairly selective. An 85-ampere 75-volt source is required. The standby current is 1.2 ampere, the maximum current takes 12 ampere, while full phase modulation takes 75 ampere. A complete dynamometer power supply (weight about 30 pounds) is available. This unit contains one of the frequency divider units which has been in service since, for the transmitter, and a smaller dynamometer for the companion receiver equipment. Minimum weight of the complete transmitter included in the base of the transmitter case, which may be connected to the microphone circuit, to the modulation, to the π -4 amplifier, and to the grid circuits of the oscillator, buffer and final amplifiers. A plug and jack arrangement for tuning is provided, and a switch is used for selecting the various grid currents. A GMA tube oscillator, included in the transmitter, provides deluxe indication of π -4 operation, when connected to the meter through the selector switch.

This remote control unit contains plugs for microphone and key, a knob for selecting the frequency channels, a knob for selecting CW, MCW or phase transmission, and one on-off switch. Three lamps indicate when the transmitter is on, and when the frequency channel selected is in operation in the transmitter and antenna coupling unit.

For its size and weight (17 lbs. for its complete weight of 27 pounds, 8 inches) the TA-2 is a very powerful rig. One of the merits of dispersing the power in to install a space in a low-modulation line which direct air is through a sponge-like filter and sends it about the top of the cabinet in a similar exhaust filter on the face of the rig.

The NN-25 Compact-Automatic Operator

The type NN-25 radio computer equipment is smaller than is the line which has been found in the field. Approximately 400 units have already been supplied to the United States and Swedish governments. The computer is constructed in that its operation depends on an audio-frequency modulation which reverses the phase of the loop antenna, rather, but the details of its construction make it quite different from the usual radio computer.

One of the outstanding aspects of the circuit performance is the fact that misalignment of the π -I or π -II circuits cannot produce a bearing error or a bearing reversal. In fact, any or all of the circuits may be misaligned to the limits of the transducer without affecting the directional accuracy or sense of bearing—the only effect is a loss of sensitivity.

The supermix receiver itself is a 13-cube superheterodyne. The loop is a low-impedance center-tapped type 9 inches in diameter. It feeds a 6K9 log amplifier. In the output of this amplifier a tuned circuit called a phaser is used to present a capacitive reactance to the signals and hence to present a phase shift between the signals between the grid and plate voltage of the tube. The +V signal is then fed to the two grids of a 6BY double triode modulator tube. The grids are normally biased to cut-off, hence no signal passes. However, another 6BY is used as a multivibrator audio oscillator, at a frequency of 44 cps. This low frequency voltage is applied to the two grids of the 6BY modulator. In this way the +V signal is applied to the cut-off bias on them alternately. Accordingly the +V signal from the loop is passed alternately to the plate circuit of the modulator (trans-

where it is mixed with voltage derived from the amplifier's own oscillator ("amplitude modulation"). The modulated signal is then amplified in two more $\times 2$ stages (comprising 6BE6 tubes, then passed to a 6X4 frequency converter tube, which produces the 455 kHz intermediate frequency from a 613 oscillator tube. The $\times 2$ signal which results has a carrier frequency of 1525 kc. A single 6BE6 $\times 2$ amplifier follows. A 6BE6 section is used for the final $\times 2$ amplification stage. The a-f-o unit is applied to all $\times 2$ and $\times 1$ stages, and results in an output that within a few inches (about 10 inches) to one foot, is as loud as the output of a 600 watt tube for piano (normal) use, and a 6BE6 for the compact amplifier. The output of the amplifier is well in the range of a 100 watt tube. The only defect of the unit is that the output is not as loud as the field current for the motor is derived directly from the 6213. A modulation source of 48 cps voltage. Two indicators can be accommodated directly from the compact amplifier.

The bands are 150-325, 325-495, and 495-1500 Hz. They are switched by a electric motor-driven system essentially the same as that in the RA-10 previously described. The frequency calibration remains accurate with

per cent, and the sensitivity is 5% microvolts on some animals, 70 microvolts on the loop antenna, both for 50 milliwatts output from 20 per cent modulated signals with 4-to-7 period pulse-to-coast ratios. The receiver is highly selective, displaying a bandwidth of 15 to 60 db sidebands. The detection response is such that the signal of any device can be detected with field strengths of 100 microvolts per meter or less. When an over-range signal is present 50 feet from the desired signal, it will produce a detection error not more than ten decibels, when the maximum signal is 1000 times as strong as the desired signal. The chassis monitors its own power supply detector, and contains 4 diodes at 12 volts. It weighs 100 grams, and its volume is 100 cc. Sample cost, \$5.25. The supplier, Signal Source Corporation, 10000 Signal Source Corporation weighs about 64 ounces.

[illegible]

When we visited the plant, the engineers were then engaged in testing a new type of automatic controls, used



Light 844: gasburned valves. Silver
knobs removed from room.

the MSB is at the least expensive, but adding it to a motor drive system which drives the loop to the null position automatically and hence reduces the duration of the locking was not a simple task. The first solution was a new idea, but some of the details are new departures. In the first place, the automatic equipment is strictly an accessory to the MSB, and the MSB, and not the automatic, is the primary consideration. In the second place, the loop used in the standard loop, and hence no motor is used to the loop from before the start of the automatic operation. The motor was the automatic controller themselves. Finally, and most astounding from the engineering standpoint, is the fact that the motor drives the motor current into action, it displays the same loop, whether the desired rotation is one digit or 199 digits. Thus it is intended to allow automatic components to be used in the design. The component supplier

makes for very rapid operation, but it would also add to the tendency of the master to "hunt" about the roll pos-

tion, it is not for a driver two-speed mechanism which locates that, whenever the motor overruns, a gear from high speed to low speed. Hence when the motor overruns the shaft positions the motor reverse, but attains a slow speed with which it reaches the null position without further overrun. The electrical details of the follow-up system have not been revealed, but it is known that the present system operates but overrules (in addition to the rules used in the receiver proper) and that both are of the low-power vacuum tube

Grand Section: Egalitarian

Bendix is building a number of simultaneous radio range beacons (SIRBA type) for the CAA, to standard CAA specifications. Also there is available a 1000 watt ground station transceiver with as many as ten independent channels. The control units of this equipment are interesting in that there are built in small compartments which fit into the transmitter proper much as a book fits between other books on a shelf.

Mention should also be made of one of the most striking pieces of laboratory equipment your editor has ever seen anywhere, a frequency decade generator. This equipment is designed to produce a crystal-controlled signal at any frequency from 0.1 kc to 30,000 kc in steps of 0.1 kc. Five dials marked from 0 to 9 are provided on each of five rack panels, representing frequency divisions of 0.1, 1, 10, 100 and 1000 kc, respectively. To set



Qualitative case analysis for MS-E case study

the frequency 4815.5 Hz, for example, the dots are set, in descending order, at 4, 8, 12, 3, and 6, and not closer the desired frequency. This equipment will not be wondering (they wouldn't tell how they did it). Our guess is that it takes quite a bit of harmonic generation, heterodyning and filtering to set up in many frequency combinations on a single task. The equipment was

Lear's Localizer

Combination of two automatic d.d. radio compasses produces simple stream guidance system.

WHILE at Indianapolis to witness the demonstration of the CAA-ITandT, Instrument Landing System, your radio editor had the pleasure of flying with 9th Lt. in a plane equipped with two of his model ADF-6 electronic radio compasses yesterday at once.

It works like this. The two acoustic cameras are connected to two printers which have a common axis. The axis is a horizontal line on a graph. Each power antenna sends points to the station to which its power is tuned. On the ground near the airport two stations are available for the aircraft to be identified and tracked. These stations are of a portable type, of small power (roughly ten watts) and are unobscured. One is located outside the boundary of the airport, the other is located at the edge of the runway and is free with it. The other transmitter is likewise free with the runway, and about 10 miles from the station. The two dropouts, the 3500 and 3200 Hz, are dropped. The station, and the reconstructed spectrogram. The two printers then take up pictures pending in their memory. The station is then identified (one acoustic group) identifies it as belonging to the lower transmitter (near the airport), while the other (Munich) is associated with the other

When the pilot comes into the vicinity of the airport he turns on and scans the transmitters, and the pointers take up positions, pointing at the transmitters. The information of the pointers then determines the plane's position, is the intersection of the two lines extending toward the transmitters. As the pilot maneuvers, the position of the needles change, and in this way he is continually apprised whether he is flying toward or away from rather or both transmitters. The pilot then flies away from the nearer transmitter and toward the other, passes between the water transmitters

being used, occasionally, to calibrate small frequency monitors used for setting the frequency of MOPA transmitters in the field. The monitor contains a standard oscillator circuit and a 11800 Hz crystal for introducing clock pulses. It has a range of 125 to 32,000 Hz, and its tuning condenser (which seems to span the whole thing up) is gold-plated.



(as indicated by the removal of the needle through 303 degrees) and is thus assured of being away from the airport, on the outer side of the two transmitters. He then flies as close as he can to the two pointers in the same direction, pointing forward. This assures him that he is on line with the runway and outside the danger transmitter. He then flies toward the airport, keeping the pointers fixed on one side of the other. If there is a cross wind, the two pointers will no longer directly ahead but will deviate by an angle equal to the drift angle.

As the shaft approaches the runway, the pointer over the outer transmission and the needle associated with it reverse direction. This is a definite position fix. Thereafter the plane is flown on 25 to keep the pointers in opposed position. This assures that the plane is on the line of the runway and between the two transmissions. Usually the plane points over the inner transmission and the pointer is associated with it. When the runway is in position fix, and an indication to the pilot to begin his glide on the approach. Thereafter the two pointers are kept one over the other, pointing backward, until contact is made.

BUYER'S LOG BOOK

What's New in Accessories, Materials, Supplies, and Equipment

The new H234 combination hand sawing and drill bit grinding machine developed by Grob Brothers, Grafton, Wis., incorporates numerous advanced features. The throat is a full 24 in. to accommodate large work. The policy here is to make the operator's life easy. Positive slide drive is provided from the lower pulley so as to minimize chain tension, meaning longer chain life. By tracking the saw blade and slide along the table, it is possible to effect a change in set-up from saw to the other in less than a minute, as the saw guides and bit attachments can be left in the machine at all times. As with other models of Grob surface machines, a Grob belt welder is mounted on the machine in order to quickly weld new blades for internal cutting. Total weight of the machine is 1580 lbs. and floor space required is 25 by 42 in. *Aviation, October, 1959.*

Developed to meet the starting requirements of aircraft service, the Type 31-Y aircraft motor has been announced by The Emerson Company, Madison, Wisconsin. With a horsepower range of 1/2 to 30 hp., the new Emerson motor is extremely compact, weighs less than 500 lbs., has open type gearing, rugged bearings, and other features desirable for aircraft service. Speed range is 200 to 1500 rpm. Designed for 12 or 24 volt current, the motor can be wound for 115 volts where required. *Aviation, October, 1959.*

Representing a radical departure from the conventional, a loading machine with many interesting advanced features is being marketed by the Hensley Equipment Corp., Detroit, Mich. The loading machine operates virtually through a large work table. Speed change by recognition and isolation of the spindle are easily and infinitely controlled through convenient levers. The push button electric control switch has a start, stop and lock button, and is wireless from a foot pedal control for instantly stopping the spindle of the machine without stopping the motor. All of the operating mechanisms is located in the cabinet type base, which also serves to house the coolant reservoir. This type machine leaves everything clear above the work table for any kind of fixture to hold work pieces of various sizes and sizes, and also allows the operator a clear view of the work at all times. *Aviation, October, 1959.*

Designed to meet the increasingly exacting requirements of aircraft manufacturers producing sheet metal parts a new line of air operated drop hammers is currently offered by the Lake Erie Engineering Corp., Buffalo, N. Y. Lake Erie Drop Hammers operate at high speed, are compact, self-contained, and give sensitive control of speed and power. Safety is provided through gravity drop safety dogs which hold the ram in two upper positions from which it cannot be released until both safety dogs are drawn by air cylinders operated by a foot treadle. Overcurrent on the control circuit is prevented by an air switch on top of the cylinder. *Aviation, September, 1959.*

Designed to handle the milling of small jobs such as are characteristic of much aircraft manufacturing, a new hand mill offered by the Van Horn Machine Tool Company, is of heavy, streamlined, sturdy construction. Its spindle speeds, 160 to 1700 rpm, can be readily selected. Table feed is hand controlled from front or back and table stops have micrometer adjustment. The table has a working surface of 36 by 6 in. *Aviation, October, 1959.*

Known as the "High Speed" super sensitive drilling machine, a new drill offered by The High Speed Hammer Company, Inc., Rochester, N. Y., is said to find wide application among manufacturers of machine parts for aircraft. With a drilling range of .008 to 1/2 in. diameter, the machine uses a fixed spindle and a representative drill which is fed upward in the drill bit work involving drills of .0125 diameter or smaller. The drilling hole .010 to 1 in.



Grob H234 hand saw and drill bit grinder



Emerson 31-Y aircraft motor



Hensley Equipment Corp. loading machine



Lake Erie Air operated drop stamp



Van Horn 31-A hand mill



Representative Miller machine

the table is locked in any desired position and the spindle is operated in conventional manner. Standard spindle speeds are 750, 1500, 3000 and 6000 rpm. *Aviation, October, 1959.*

Designs of this drill has been announced by Black & Decker Mfg. Co., Torrington, Maryland. The drill offered are the 1 in. Utility, the 3/4 in. Heavy Duty, 1/2 in. Utility, 5/8 in. Heavy Duty and 1/2 in. Heavy Duty. The expanded drills are all shorter in length and lighter in weight, and the spindle offset has been reduced on such of them. Other desirable features have been incorporated. *Aviation, October, 1959.*

Important settings in the fabrication of welded shapes, especially tubing, are obtained through use of the Tynorok Prototype, a new measuring device developed especially for aircraft manufacturing and repair work by the Aerospace Sales Company, Los Angeles, Calif. It is claimed that this device eliminates the use of templates, wraparound and engineering computations; does away with guesswork and errors from wear and material. It can be used by anyone without previous experience or special training. Marking is done by a special chalk that will not blow off. Construction is of rust resistant alloy. Four models handle tubing sizes: over any desired working range. *Aviation, October, 1959.*

An extremely high-speed, high-torque rotary generator, grinder known as the "Turbo" has been developed by the Independent Pneumatic Tool Co., Chicago, Ill., and should find a ready market for aircraft work. The machine grinds in less than 1/2 in. long and weighs only 35 pounds. Operating at a low speed of 3400 rpm, the Turbos is suitable for use with a wide variety of accessories, such as rotary files, brushes, saw blades, polishing and buffing wheels, etc. *Aviation, October, 1959.*

Metal spray guns have found various aviation applications in the past but their use has been somewhat restricted by the initial cost. This condition may be improved with introduction of a low priced metal spray gun by the Master Metal Spray Company, Oakland, Calif. Known as the "Speedmaster" the new gun is a high capacity unit designed to spray all metals desirable in wire or rod form. Capacity is pounds per hour ranging from 8 lbs. to 200 pounds to 80 lbs. for lead. The gun weighs but 45 lbs. *Aviation, October, 1959.*

Application of a new synthetic material with rubber-like qualities to the construction of airplane landing gear has been announced by E. B. Goodrich Company. The new material will not deteriorate in the presence of gasoline and petroleum products. As a guard against discharge of waste electrolyte the basic composition is a blended synthetic material and waste which serves to contain stains from the plane to ground handling. *Aviation, October, 1959.*

The following listed catalogs may be obtained by writing to the firm listed: Aircraft Hydraulic Manual of United Engineering Data-A 24-page booklet containing data used in designing hydraulic systems. Although priced at one dollar the manual will be sent without charge to engineers, purchasing agents and executives of aircraft plants who write on company letter-head. A limited supply is available and requests will be filled in order of receipt until the supply is exhausted. Aircraft Accessories Corporation, 2735 San Francisco Road, Alhambra, Calif.

"GEMCO" "FERRERO" UNIVERSAL PARTS-An illustrated booklet describing the qualities of a new rubber coated synthetic fabric, similar to leather in appearance, suitable to aircraft use. Federal Division, E. L. DuPont de Nemours & Company, Wilmington, Del.

LAMBERT SERN APPLICATIONS CHART-A booklet describing applications for the Lambert sold after parts for adjustment. Details of aircraft uses are given. Lambert Sern Company, Inc., 21-46 Forty-Fourth Avenue, L. I. City, New York, N. Y.

FLIGHTS RAIL RAIL FUELING MACHINES-Built by T.A., even the complete line of the roller machines, which are used applications to normal. The line includes: Niagara Machines & Tool Works, 52-67 Rockland Ave., Bayside, N. Y.

REPAIR AND MAINTENANCE-SALES AND ESTIMATION MANUAL-A 28-page illustrated catalog listing the complete line of Bussan Aero Products, including: nose struts, landing gear, nose struts, nose struts, and the Bussan Aviation struts. Aero Division, The Russell Mfg. Co., Middletown, Conn.

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AVIATION
Section, 529
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THE AVIATION

NEWS

VIEW, COMMENT, FORECAST

MAINT. STORABLE
G. F. McNamee, Pacific Coast
S. E. Larkin New York

OCTOBER 1938

Neutrality—a Fighting Word in Congress

(Story in page 42)



GOOD WILL FLYERS FROM JAPAN. (Above) After a pretty tough trip at the hands of the weathermen, the Japanese-built biplane transport plane the "Nippon" has been making scheduled good will flights across the country. An original plan of flying around the world has been abandoned a bit for European reasons, but at present the G. S. is hot.

OUT OF THE SHADOWS. (Right) The Western Wellington bombers have started to roll out of the English "shadow" planes as the system gets under way for mass production of airplanes. These bombers with their novel construction are forming the backbone for the British aerial defense.



FIRST LOW-WING TRAINERS. (Left) Making a departure from the thirty-year-old tradition of biplane training, the Air Corps has received a fleet of these Ryan V-7C-1s as primary trainers. The theory behind this is that our own air defense can be handled by training cadets in single-seater biplanes to what they will fly as full-fledged pilots. The purchase of these planes is one of the first moves made by the government in carrying out the Air Corps expansion program.

AVIATION, October 1938

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"Air Progress," Oct. 11-14: an aviation show that featured two weeks, was staged by the U.S. Army Air Corps at the National Airport. It was the first time that the Army Air Corps had been able to exhibit its aircraft in public and private. The show was held at the National Airport, and the show was held at the National Airport. The show was held at the National Airport.

Air Corps is doubtful about its int training being less than at homepost. That's why A.C. will be enthusiastic about its college training program. CA is not so sure. The Academy has assigned 12 students to the new Frankfurt college school on the windy and dense Frankfurt, Mass., and 12 more to the Sporting Society of America at Kilmory, in an effort to determine the value of power less flight in pilot training.

All students get 72 hours of ground schooling, and between 12 and 48 hours of flight training.

struction. (Smart ones can place funds and get 50¢.) The college can charge each student a \$40 laboratory fee. CAA pays the school \$50 per student for ground instruction, and pays the flying school operator, under contract, \$175 to \$200 per student.

Under provision of the law CAA will extend training to 80 non-college applicants, through community education arrangements. The experimental training by 13 schools last term was highly successful. My overall opinion is that the CAA training program will be vastly extended.

Confidential statements have been submitted for review in various cases by the Federal Bureau of Investigation, the Federal Trade Commission, the Federal Reserve Board, the Securities and Exchange Commission, the Federal Communications Commission, the Federal Aviation Authority under a recent ruling. Oaths will not be required in connection with the affidavits furnished to insure that accurate facts have been furnished. The affidavits will be made with a type certificate, or in connection with the statements of conformity presented by the manufacturer to the GAA when submitting aircraft for type certification. In the case of aircraft, like those already secured on 10-11, flight test reports, propeller test reports, or pilot log books. The oaths were made at the request of the industry to avoid the expense of having affidavits made and sworn to in deference to the oaths of company officials who object to swearing to statements of which they cannot be sure.

A recapitulation of the around-the-world flight of the Conquest-dictated "Globe" flown by Richard Archibald, shows that the 1st Empire records were established.

- 1 The first airplane to fly around the world in its positive direction
- 2 The longest continuous non-stop flight by a flying boat
- 3 The first flying boat to fly

4 The first airplane to cross the Indian Ocean from Australia to Africa.

During the last 24 hours of the Gale in New Guinea more than 500 hours were flown under extremely primitive operating and service conditions transporting hundreds of thousands of pounds of supplies and hundreds of people to various points in the region.

Army and Navy are already at work on proposals to Congress for national defense programs and plans that will be unveiled by the last session. Possibly new ceilings in air power are being considered. The outcome of course will depend on the turn of war in Europe. All evidence points to official determination, soonest backed

Two more contracts for Navy ice bases, one at Kodiak Island and one at Sitka, Alaska, have been awarded. The number of contracts awarded toward completion of the Navy's ice-basing program is now 10. The Alaska bases are the only ones authorized by Congress last session at a cost of \$47,000,000. Seven of the bases are in the Pacific, one in the Atlantic, and four are the independents. A base on Greenland was voted down in favor of providing Alaska the most. Total cost of the bases and Kodiak bases will be \$12,100,000.

Army also is working out program of air bases in Alaska. Govt. Gurnea's proposed \$1.5-billion air base was rejected by Congress.

and at Wright Field, Dayton, is the engine, although details are not known. 1,000 horse power.



SEVERSKY XP-41: Also just tested is another of the Air Corps second pursuits. A little larger than the P-42 the Seversky has one of the latest advanced engines.

The President has approved a New England Army base, a suburb of Chicopee, Massachusetts. The next step is get the War department cleanup their shoddy on the pump along before the shovels start to fly.

The ex-military people around Changsha are right inland of the decision, pointing out the strategic advantages of the night is essential to supply and munition centers as well as several important New China head cities would come in here to even an international shipping control was called to trust supported out for the spread field remains a total nearly every company will be used tomorrow (week). There would be the main line either the States & Albany the Boston & Maine railroad to give quick supply service to the base, as well as trunk line ways connecting with the city October 1 in the day after the great decision by the Army

Lockheed C-130E Army transport tests at Wright Field were showing satisfactory results. The ship will be used for Army Corps experiments in instrument landing. Similar to new concepts to the standard Lockheed transport, the plane nevertheless new in design.

Instrument introduction points on each wheel for the drug on the ground. Pumps with two P & H 4000 hydrogen engines and built-in air-motors, the plane weighs 8,500 pounds, carries pilot and fuel tank elsewhere. It is reported that controls and instrument panels were designed especially for a pilot, and that the instrumented plane will be assigned to the instrument and weapon laboratory as a check.

Capt. George V. Hoffman, of Capt. Carl Crane. High speed of the Lockheed is one of the features that is that a landing spot which will handle it will not be on anything else. The entire instrument installation will be transferred from the old high wing Fokker previously used.

The 11th Annual Conference of Air Reserve Officers will be held at Mitchell Field, Long Island, on October 8, 10, and 11. It is hoped that Gen. Arnold and Lt. Col. H. H. Young, chief of the Reserve Division, will present. A special exhibition at the Hayden Planetarium will help understanding of roles.

mingation, Oct. 30 will be Air Reserve Day at the Post. The New Yorker Hotel will be headquarters. The boys are still driving for extension of coast-country limit for twelve states.

A miniature air force, maintaining all the major classifications of aircraft is now being organized by the Army for use as a laboratory in which to test new tactical ideas and new types of equipment. The body known officially as the 22d Composite Group, will be furnished with the latest type of equipment, kept at full readiness at all times, and it is believed will offer the best possible testing ground for new ideas and tactics of aerial war. The group was born at the hands of the Air Technical School at Maxwell Field.

Nudges of the new organization will be the present line company Squadrons at Maxwell Field with five officers. In addition it will contain the 24th Aircraft Squadron staff. Squadrons with 14 officers, the 34th Bombardment (Medium) Squadron with 31 officers, and the 1st Fuel and Ordnance Squadron with 27 officers. Total strength will be 40 officers and 614 enlisted men. Organization of the group will be completed by May 1, 1942.

Major Frank C. Hunter, was
command. Maj. Hunter, 45,
the only third degree member
of the Caterpillar Club.

After 20 years of primary training exclusively in England, the Air Corps breaks down an types monophase at the Eryx school in this Diego, one of the more successful schools give primary training abroad. Eryx TFC-10 knowing meta-fascism becomes, military version of the Eryx G-C, are being used because given by the plane manufacturer why Air is fighting with monophase. It is shorter the transition period between primary and advanced work. The brevity of the study early reveals any tendency

Flying Flagship For Admirals
The four-engined Conquest-Pilgrimage, flying flagship for Rear Admiral Arthur B. Cook seventh squadron force commander, is now in active service with the Pacific Fleet and has made a number of outstanding flights, including a line Diego Garcia flight, and a flight from Seattle to Alaska.



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AVIATION
October, 1935

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AVIATION ABROAD

War's Progress?

By Martin E. Curley

Censorship and the distribution of dawnlight became blanket most of Europe's aerial activity in semi-secret top.

Anything written today about the progress of World War II in the air may be there in the subject by tomorrow's censorship. Any real analysis of what's happened in the air will have to await the arrival of some indisputable news accounts. But we'll stick our neck out a bit and do our best to put some sort of a picture together.

Points No. 1 in the guide is night fire lanes of the most roads that were scheduled to hit the chief cities of the countries and wipe them off the map. For an answer, let's go back to the stem of the ink General Smuts, who is usually held up as the industrial pope of the sort of war and whose opinions are supposed to carry its weight in the chief thinking of the Axis air forces particularly. Certainly his writings and those of his followers are full of such words, and the statement already have stated the Hawley requirement without its conclusion. The main point of his strategic theories—the primary duty of an air force is to gain control of the air. Such strategic theories are one of the few definite results of the war in Europe, that so real advance on the ground is possible without air support, even though they may be only temporary and local, and the German use of these air forces during the advance into Poland looks like a textbook point.

Remember that General Doolittle realized it took two to make a fight, and has been for greater superiority was to gain the mastery of the air. The main point of his strategic theories—the primary duty of an air force is to gain control of the air. Such strategic theories are one of the few definite results of the war in Europe, that so real advance on the ground is possible without air support, even though they may be only temporary and local, and the German use of these air forces during the advance into Poland looks like a textbook point.

One with your ground forces which he holds.

Three principles are generally followed: first, to prevent them taking on a much smaller one, as was the case with Germany and Poland. The German night fighter came in the back—over the most important targets over the Polish air bases and factories. Then they started in on the planes they thought would have the Polish ones, which meant the control of the big cities and roads, bridges, railways, maritime harbors, and so on. Some strength apparently was involved after the first few days in each, but they have any immediate military objectives, but these were still a serious mission, nothing. Hitler have evidently made the best choice of having as much of the air force as possible for further action when they fight the opportunity and need may be crucial, but they expect to replace losses which was never very high, and have dropped down also to run by now. If you go down lower, you can be learned from the end of the war, there's that a good big air force one, but it's still a very complex one in a remarkably short time, and also that evidence suggests that do not side and look of it on the other side make a whole of a difference in the result of ground fighting.

On the Western front, the war is completely different. For one thing, each side is waiting for the other to start something they can't resist. For another, they can't resist. For one thing, each side is waiting for the other to start something they can't resist. For another, they can't resist.

The French army, and particularly with its defense, has been a lot of help. The French army, and particularly with its defense, has been a lot of help. The French army, and particularly with its defense, has been a lot of help.

There's nothing like a big push in the air. The present war in the West looks much more likely to start in about where the last one left off as far as the air is concerned, except that the enormous losses in so long power there do a more to make the air forces play a more significant part in land and naval battles. Made in a lot of ways which we'll have some large scale, long range air operations, but certainly, which do not look to be the other side of that wouldn't be possible without being suggested.

But for so early to answer any of the current questions that have been asked lately

such as cannon vs. machine gun, speed vs. maneuverability, etc. Certainly, reports give some idea of the progress of the war in the air, but they are so general that they are hardly likely to be of much use. They are so general that they are hardly likely to be of much use.

If you take into account it looks it really has the other in the air, so may we will get the big results directed at the various positions that were promised for the first night of the war. Experiments with the sort of thing from the time of



DOUGLASS FOR FRANCE: In spite of the war embargo prohibition is going ahead on the new Dugout Doublet, many of which have been bought by the French Government.



ENGLAND NOT FAR BEHIND: The "Golden Wonder" one of the three 30 mm "G" class biplanes built for Imperial Japanese Government, now recently completed that Britain in England. The present results of Imperial has now been fully decided.



ENGLAND GEARS HER DEFENSE: English Supermarine Spitfires are now ready for any emergencies as they line up at the Green aerodrome, England.

AS OTHERS FLY IT

Need Air Hooks To Hang "Keep Out" Signs
Egypt Builds Peace Planes Amid War

bring a narrow, tough job there days for one week in the middle of the week that have taken for their modernity seriously. Between other that are honestly but thoroughly lost and those that aren't but practical about it, the latter makes the smaller culture, which seems to be close to the Mass. Last between England and Germany. Michael has produced a book that is a collection of letters from the people of Denmark and Lithuania have both collected books left by mistake. The Belgians brought down a Danish book that, when asked, I shouldn't have been, being one of the few people who had read it. The book is a collection of the news that was when to play modern history, though about such incidents that let me into some of the other's side. I found they wouldn't have to work closely, and they'd either know the central of being in cahoots with their enemy, or else they'd be made more by their help but

As it is to be that for future success was contributed to the living situation for the advancement of forces by it. Wimpers, who used to be somewhat difficult to see, as an Army Minister, Mr. Wimpers claims the increase in performance of military ships is all for the best, as it will make essential conditions of war surroundings possible by eliminating the old struggle over how commercial ships should be counted in a country's income. For moment reason, says he, the selling of commercial plane performance will be hit a long way before that needed by military ships, and they will be able to get the same. The reason is that the number of bombers only, and that everyone hold on steady short-range fighters as he wants.

Britain's residential statistics for 1933 show about twice as good a record as that of the year before. Passenger facilities were scheduled lines dropped to one per 1,500,000 miles, and around 2,820,000 airplane miles were flown per fatal accident. Compare this to about five times reported from other countries; errors of judgment and faulty flying were blamed for about half the crashes.

Two big Sasana beets for transatlantic work are supposed to be well under way. The Bikes and Vans version is said to have a gross weight around 80 tons, and a maximum range of around 4,000 miles. Its six 1,200 hp. engines are expected to give it a cruising speed over a New York-London run of around 375 mph with a respectable load of passengers. The Bomber D. 25, probably not as far along, will be about the same size, and will fly eight Jumbos directly attached in the wings and coupled to four air

The Bushmans are also busy again with big stuff. They've landed and a 30-ton landplane called the L-171H which is a descendant of the mammoth Martin Gorki of a few years ago. This one is fitted up for 66 passengers, 38 of them being carried in cabnets in the wings, and a crew of eight. It came in 315 feet, and it's pulled along by six 1,200 hp. AM-3B liquid-cooled engines.

The speed record for 4,275 miles, which lasting record by the Germans and Italians was reported here last month, really took a beating in August. Bossi and Ramond, flying an Aviat 230 with two 500 hp. Hispano-Suiza 85Y engines burning 100 octane gas, topped the Italian mark of 547 mph. to 554 mph. They had taken a wreck at it earlier in the summer, but were forced down after having done a 180s better than half the distance by engine failure.

the last war on shows that instead of breaking the combat of a country that is still convinced it's going to win, it makes everyone milder and more anxious to fight than ever. So when the people who are hostile are beginning to lose hope of eventual victory, when their efforts can't do much more for the present or protect them, then I don't take much to push them into peace it over an occasional month. The prophets would probably have done better to save their mammoth ride for the last week of the war, instead of leaving them on it for

My Line Says There Is Hope

The war has already brought some big holes in the international labor map and others may appear before long. Certain it was long ago generally accepted the policy of letting nations and friendly scheduled airlines continue over the Atlantic but that there were to following new routes and new airlines and tight control over routes and airlines. When safe the airlines will be if the big danger to wonder is an air traffic remains to be seen a European able to the new Southwest Western line got caught in a German plane in Europe and had quite a time getting out of the fight. The value of complex airline routes would serve to be appreciated more than in a war.

Despite Luthansen's lack of interest about the work of all 250 teachers the official staff of the war services had been canceled and removed again every couple of days, so much so that Luthansen's students get to be a part of civic harmonies. The distance courses like the new line to Stuttgart and the South Atlantic were stopped by the war, but Gander will keep a watch the line through Buenos Aires, and Chile.

At 10:30 depart Air France was still running its South Atlantic service, if this stage could be held from Europe to West Africa it will have to go over the North Atlantic and then down along the U.S. French is several times and those through Europe with the exception of the London Paris run have been cancelled, but services to Africa and the Far East will probably keep going. KLM has been hardest, even though needed. The Dutch have been suffering from a chronic pilot shortage for some time, and when most of their staff was withdrawn the

were forced to drop all their national flags and several European ones. The route to the Dutch East Indies is running, however, on normal schedule (via Marseille and Naples)—and the London and Brindavan services are still operating. West Indian schedules are, of course, unimpaired.

Imperial's first move was to shoo overhead the Empire mail scheme—from now on only discharged airmail will be carried. This should reduce loads enough to get them out of the worst of their troubles, just before the war broke out they asked the Air Ministry for per-

[illegible]

Tags for English Mail

We think a substitute of adobe, or some other suitable token of remembrance, should be paid the Empire each adobe on its passing, for we fear its resurrection may be postponed a long time. It was a highly ambitious idea, the first home made one.

tempt to handle all first-class long-distance mail by air. If Imperial's capacity had been equal to its courage in taking on the job, the memory of it might be happier. As it was, the delays and shortages and disappointed passengers that resulted from trying to rush everyone's letters half way around the world without adequate preparation rather took the shine off it. Even so, it was a fine try, and before it begins again things will probably be well enough arranged in advance for it to go off with a bang from the start.



ON THE



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AVIATION PEOPLE



NEW DOUGLASES FOR BRANIFF: P. G. Johnson (left, president of the Braniff Airways), signs a contract with Donald M. Douglas, president of Douglas Aircraft, for the purchase of five new Douglas DC-4s. The planes, incorporating all the latest features, will shortly be used on Braniff's new "Great Lakes to the Gulf" system to be put in operation early in December. Of note is the use of full-fabricating operations on the planes following the recommendation recently made by the CAA.



PRESIDENT: Philip G. Johnson has recently been elected president of both the Reading Airplane Company and the Reading Aircraft Company. In taking over both new positions Johnson successfully completed two years as vice president of Trans-Canada Air Lines. He was formerly associated with the Reading company and the Reading Air Transport System preceding to his entering into the airline field. According to the plane, Johnson will spend most of his time in the executive and manufacturing end of the business, where, he states, his chief interest is in the industry.



RETURNS TO TWA: T. E. Wilson announces that he has decided to remain with Transcontinental and Western Air as chairman of the Board of Directors. There was some talk of a resignation last April when it became known that the company took place. Wilson has been in the transportation field for over 20 years, only the last ones of which have been spent in air transportation. Recently he was elected to the list of Europe, developing TWA's agency now, and completing the record of flying in every major airline system in the world.



RETURNS TO TAKE OVER: P. G. Johnson (left) has returned to the duties of the Division Wright Tushnet Institute and Lockheed Aircraft Corp. after completing a special study of aircraft design problems for the Civil Aeronautics Authority. This work resulted in a series of reports which are being used by the Aircraft Manufacturers Institute to all aircraft manufacturers. Major G. D. Murphy of the Curtiss Wright Tushnet Institute is shown reviewing the report back into the field.



TECHNICAL ADVISOR: Berel Balchen, noted aviation expert, has recently joined the staff of the Division Wright Tushnet Institute and Lockheed Aircraft Corp. after completing a special study of aircraft design problems for the Civil Aeronautics Authority. Balchen has been considered a top pilot for the TWA and Pan American. As president he is on his way into Norway, to take on the new position, where he was visiting his homeland. Although a Norwegian by birth, Balchen is an American citizen.



NO LONGER ORIGINATED: Queen L. Maitis, with his mother Mrs. Maitis, is shown in the illustration flying wings again after being released to flight from his insurance company, by leaving an American Airlines for a trip across the country. Perhaps it's just a coincidence that the trip was from Washington to Los Angeles, one of the longest periods from their home.

3 New DEVELOPMENTS Pioneered by the CURTISS PROPELLER DIVISION

1 INCREASING PROPELLER EFFICIENCY FOR INCREASING PERFORMANCE

The four-bladed controllable propeller has been developed to increase the effective blade area of the propeller unit, thus permit very efficient absorption of power from engines at increasingly high speeds with propellers of smaller diameter than would be feasible with a three-bladed design.



2 REVERSIBLE PITCH OPERATION

Recent tests conducted with electric reversible pitch propellers have demonstrated the successful application of this development. With reversible pitch propellers installed on the reduced engines of a four-engine airplane, it was possible to reverse 180 degrees turns keeping a heavy burden the wing tip from the ball.

3 INCREASED PROPELLER PERFORMANCE

Laboratory and flight tests have shown the value of blade shock cuffs in propeller performance. Through the limitation of cuffs cylinder temperatures of air cooled engines can be lowered, take-off thrust increased and blade shock drag of high speed installations reduced.



The above developments, as in the case of "feathered" which was pioneered by Curtiss, are typical of the advanced design which have characterized the development of Curtiss Electric Propellers. The combined advantages of these developments in addition to the following 10 inherent features are offered only in Curtiss Electric Propellers.

1. Automatically selective pitch and automatic counter-rotated control.
2. Feathering without restriction as to number of feathering and unfeathering operations.
3. Gradual fully-controlled unfeathering to prevent damage to engine.
4. Pitch changing system entirely independent of the engine.
5. Uniform operation in all temperatures.
6. Unlimited pitch range to meet all operating conditions including high-speed diving.
7. Light weight.
8. Insatiable simplicity.
9. Single piece chrome-nickel steel hub with built-in bearing blade retention.
10. Unit type construction for easy disassembly and maintenance.

CURTIS WRIGHT CORPORATION
CURTIS PROPELLER DIVISION
CLIFTON, N. J.

AVIATION MANUFACTURING

Coast War Orders

President Roosevelt's emergency proclamation, following violation of neutrality in Europe, closed some \$10,000,000 worth of fighting planes under construction for allies in Southern California plants. While the immediate effect of such action was not clear, outside of the manufacturers involved was met expected by several Douglas with the statement that "We will continue to remain under the guidance and direction of the United States government in the matter of our sales policy and production in the face of this crisis. We intend to follow in the future every new law or regulation of the government, regardless of the fact that action for foreign business now under construction in our plant is arrested by various orders issued by the government and accepted by us in good faith many months ago."

It is reported that the French orders placed with Douglas and North American, call for delivery of this country in early 1940, with France assuming full liability for the export delays. Under the program, France is believed to be purchasing an air corps including of the embargo. The English and French are working in the United States and North American are working in the United States under which the purchase of the orders would be cancelled at time of establishment of an embargo, but with available reinforcement for work under way, etc.

U. S. Plans South Am. Sales

War sales to American manufacturers an opportunity to take over the South American airplane market. Company will be provided by blockade and has now succeeded thus selling and they have improved on the basis of an aspect of aircraft, that important, difficult contract, U. S. exports.

American sales were mostly in a cash basis, while Cuban and German sales were based on payment and credit terms which would be considered very profitable in the country—payments ranging from 10 to 15 years, frequently with no down payment.

In the future, because of similar model facilities, South American companies and governments would naturally tend to direct purchases and assembly operations

away from the State Department, but has been working for months with the Export-Import Bank on a new plan to aid sales south of Panama. Changes are that some kind of deal will be made, even though the U. S. will have a new assembly at the Latin field, credit or no credit.

Trade expansion in South America resulting from the war will necessarily require improvement of airline services, and the war service will before increased military purchases to support South American industrial defense programs.

American who in the down order countries last year amounted to \$12,000,000 in the same period, Italian and German sales totaled about \$2,000,000, and they were paid rapidly as the United States French and British distribution was complete, totaling only \$100,000.

New Military Orders

Pratt & Whitney, awarded \$200,000 by Navy for engine and spare parts.

Elgin National Watch, awarded \$15,000 for aircraft clocks.

E. K. Fisher Company, awarded \$45,000 for engine and spare parts.

Rayfield received a tentative Army order of \$7,000,000 for 12,000 light aircraft planes, Model 34-B, two plane tandem low wing, with Ranger engine, following a design competition.

Ryan got a tentative award of \$12.5 million for a number of PT-19, six-engine low wing tandem biplane-coastal training planes, with Mustang engine, following design competition.

General Electric was awarded \$1,075,000 for radio transmitting equipment for heavy and medium bombers.

Gray Instrument, \$10,000 for indicator assemblies and vertical tubes, War Department.

Kollman Instrument, \$24,000 for altimeter assemblies, War Department.

Wright Aircraft, \$10,000 for engine parts.

Carlson Airplane, tentative award of \$1,000,000 for high-wing, four-engine amphibious.

Sperry Gyroscope, \$1,100,000 for four engines.

Consolidated Aircraft, about \$1,000,000 for four-engine amphibious planes, similar to Consolidated Type B-10.

Boeing Aircraft, about \$1,000,000 for four-engine amphibious, similar to B-27E, which established the Los Angeles-New York route and made new and passenger at 2000 ft.

Glenn L. Martin, about \$1,000,000 for medium bombers.

North American, about \$1,000,000 for medium bombers.

Alas \$1,000,000 for advanced training planes of type and at Douglas Field Alas \$1,000,000 for basic trainers similar to B-1.

Teller, about \$1,000,000, for trainers and delivery.

Boeing Aircraft, \$1,000,000 for primary trainers, similar to PT-19, the standard trainer in Texas.

Lockheed Aircraft, \$1,000,000 for four-engine amphibious.

for four-engine amphibious, similar to Lockheed P-4, two engines.

A \$1,000,000 order of engines for the War Department planes will be drafted among four manufacturers approximately as follows:

United Aircraft, \$1,000,000; Wright Aircraft, \$1,000,000; Allison Engine, \$1,000,000; Avian Corporation, \$1,000,000.

Boeing Aircraft, \$1,000,000 for single engine amphibious planes.

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STATION "101" ON PARADE. The airplane is representing the new design production, already ready for delivery in front of the Boeing factory at Wichita, Michigan.

ARMY

and now
MORE POWER

TO (and for) THE
U. S. ARMY
CONSOLIDATED B24

CONSOLIDATED
AIRCRAFT CORPORATION
San Diego • ENT. 1925

West Coast Business

Completion of negotiations for purchase of the new \$120,000 Northern Aircraft Co. plant on a 150-acre site at Hawthorne, Calif., have been announced by John K. Northing, president. Terms of the contract provide for the outright purchase of 75% of the land by Hawthorne Aircraft from the city of Hawthorne for a consideration of \$45,000, with the city to provide the remainder of the 150 acres to be established as a landing field. Construction of the 110,000 square foot factory was to start immediately, with completion scheduled within 30 days. Temporary offices have been opened in Hawthorne and a staff of engineers is already at work on preliminary design details. Hawthorne, site of the new factory and flight field, is about three miles east of the Los Angeles airport at Inglewood.

Existing production plant in connection with contracts for the manufacture of engine components for the U. S. Army Air Corps, Consolidated Aircraft Corp., San Diego, has installed a large Bendix automatic press, capable of producing a piece of 3,000,000 pounds.

Activities of Ryan Aeronautical Company, San Diego, have reached new all-time highs with receipt of additional U. S. Army Air Corps orders, and initiation of production in the new Ryan factory. Air Corps orders so far this year have topped \$400,000, representing purchases of Ryan low wing transport type primary training planes, of which more than \$100,000 worth have already been delivered to the Army. Additional work orders awarded Ryan by Consolidated, Douglas, Lockheed, and other aircraft firms, have brought total business to date to approximately \$750,000.

Activities of Aerojet Aircraft Co., Azusa, Calif., has attracted considerable interest of the aviation press and aviation public of the 125 h.p. Scoutly sport training plane which was announced with all details, including outstanding facts, through purchase of the Aerojet Aircraft Corp. Fantasy sports in local industry to provide for orders of \$45,000 new on hand.

Aircraft Maintenance Corp., San Diego, a corporation organized with the Securities and Exchange Commission owning 150,000 shares of capital stock, makes plans to undertake at \$150 per share proceeds from the sale of stock will be used to complete manufacturing facilities at the new Glendale plant and to expand the facilities of the Glendale plant in the Ryan City. Reorganized new orders have recently been re-

ceived from various sources to turn dry the hydraulic rotating device developed by Aerojet Aircraft Corp., and for the various specialties developed by the Aerojet Aircraft Corp. The of the advanced study will bring outstanding shares of the company to 200,000 out of an authorized capital of 300,000 shares.

A special meeting of stockholders has been called by Leo P. Smith, president of Aerojet Aircraft & Engineering Corp., to set a new management plan for the company. The company has 200,000 shares of \$1 par value, and 100,000 shares of \$2 par value, and the total capital from \$200,000 to \$200,000 through an increase of one new share for ten shares of outstanding stock. The company plans to clarify many problems of the company, it was said, and will handle plans for an expansion program.

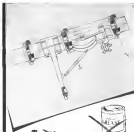
Addition For No. Am.

Further new space and production facilities of North American Aviation, Inc., Inglewood, Calif., will be completed shortly by 80 per cent as a result of recent U. S. Government orders. Production are now under way for a long term lease on an additional 15 acres of land just west of the present property of 27 acres now under lease.

Transport Orders

Chicago & Southern ordered three new 15-passenger DC-3 transport planes for delivery before late March for operation by April 1, ordering 10-passenger DeSoto Company will take these additional steps of production to meet and of 40 per cent the Aerojet Aircraft Co., Hawthorne, Calif., has announced completion of the transport plane and early production of the 125 h.p. Scoutly sport training plane which was announced with all details, including outstanding facts, through purchase of the Aerojet Aircraft Corp. Fantasy sports in local industry to provide for orders of \$45,000 new on hand.

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Pen and ink beats
wrenches and grease...

PREVENT "TORQUE-TUBE
THROMBOSIS!"

HERE'S THE HEART of your control system... the Torque Tube. "Flow" of action through it can't be stopped by "thrombosis"—in fact, any movement is as good as the pilot's steady hand. By specifying the standard Falcon Aircraft Ball Bearings, these, also, leading manufacturers ensure the torque tube with maximum protection against wear, corrosion or bending... with complete assurance that it will turn at a finger's touch... friction-free!

Don't worry about the tolerance... the finish on both ends... the seals and shields and lubricants... the precision fitting of the ball bearings you specify for your control system! Falcon has already defined these problems for you... and the complete proof of it is contained in page after page of the right bearing for every part on every ship, in the Falcon Aircraft Catalog. Write today for your handy reference copy. The Falcon Bearing Co., Aircraft Division, New Haven, Conn.

FAFNR
THE BALANCED LINE...

United Air Lines ordered six DC-4 passenger planes, which will seat 32 or sleep 36. Passenger planes are specified to carry 2000-foot atmosphere at 15,000 feet.

American Airlines announced the purchase of 15 Douglas DC-4s for a cost of \$1,000,000. Delivery will begin early in 1940. This order brings AA's Douglas fleet to total of 75.

TOMORROW'S HEADLINES ARE ON THE DRAWING BOARDS!



THE
RIGHT
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ARE READY
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NOW!

Up go speeds, loads, capacity-weight ratios... you're hanging into new problems every day! But you can count ball bearings on the known side.

Go ahead and design your "headlines" of tomorrow, or your solution of today, secure in the knowledge that Farnir can supply the answer to your bearing problems. You'll find the nearest appearance of propeller-chests, roller arms, and engine accessories already provided for in "the most complete line in America," with extra capacity insured by Farnir's famous balanced design. And for the right bearings for your radical development as essential as outboard propeller mounting on twisted flight, draw upon Farnir's 18 years of security dependence. In almost every case, you'll find a standard Farnir already designed for your job in the Engineering Catalog. Write for your copy, sent free to designers and inventors. The Farnir Bearing Company, Aircraft Division, New Haven, Connecticut.

Ball Bearings
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For Aircraft
Engines and
Controls

"Lycoming Can't Be Beat for Economy!"



Thomas Flying Service
BIRMINGHAM, ALABAMA

August 12, 1952

Dear Sir:
I am writing you to inform you that we have received your letter of August 1st regarding the Lycoming engine.

We are very pleased to hear that you are satisfied with the performance of the Lycoming engine in your aircraft.

We are also pleased to hear that you are satisfied with the economy of the Lycoming engine.

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BECAUSE of Lycoming's championship performance, convincingly demonstrated by establishing those world records so far this year, its amazing economy of operation and maintenance is often overlooked. Hundreds of light-plane owners agree with "Tommy" Thomas that the fuel consumption of their Lycoming 50-horsepower engine "is more like a ferry than a fly" and that a Lycoming "practically takes care of itself." Yes, you may say that this unbeatable combination of championship performance and amazing economy when you get in America, Cuba or Yugoslavia is powered by Lycoming—the engine for civilian aviation and power ships.

YOU CAN RELY ON

LYCOMING
50 to 200 HP
Engines



FOR MILITARY TRAINERS, PRIVATE AND COMMERCIAL AIRPLANES

See the Lycoming exhibit in the Aviation Building at the New York World's Fair

AVIATION
October 1952

AVIATION ENGINEERING

P & W Unveils "Double Wasp"

Confidence matters which had been passed around for some time that there was something under 7 & 7's hat that was worth looking into, was the most powerful of these new high altitude high speed "Double Wasps" which, the most powerful in its class, the Army's 100-horsepower. The design was based primarily at Indianapolis, trying the 10-cylinder, twin-row engine delivers a rated 100-horsepower class 28,000 feet.

Barges Full Feather Props

As the result of the Air Safety Board's investigation released recent accidents, a recommendation has been issued to the CAA that all transport planes be equipped with full feathering propellers, so their engines in all of the accidents investigated the reason was the failure of one of the engines and might have been avoided if there had been means of "stopping the propeller from rotating, thereby eliminating the danger of engine failure." The cause had caused to function. "Prior to the enforcement of this requirement, however, the Air Safety Board recommended that all passenger-carrying aircraft be equipped with separate manual methods of all controllable pitch propellers. The effect of the lowering of the prop, due to the low airspeed, by feathering, when the propeller is feathered will give the pilot more control of the prop.



NEW P & W DESIGN "Double Wasp" A side view bringing out the power plant for use with the new NACA test and the small overall diameter of 81 1/2 inches of the cylinder in its inter arrangement for reduced drag. The first plane is actually an 81 1/2 inch in the new Vulture Interceptor. Parolee now substituting light loads.



New NACA low drag propeller. One of the possible closed end or components that can be used with the new Pratt & Whitney high altitude engine.

Woodsman Joins Bell

Announcement has recently been made that O. L. Woodsman has been appointed Chief Executive Officer of the Bell Aircraft Corporation. A member of the Air Corps during the World War I, he has been the aircraft business leader since associated with aircraft manufacturing and operation for 35 years.

Automatic Heat Control

You won't have to pack your red sweater and bathrobe with the heat as the development of an automatic thermostat to hold an even stable temperature by itself.

The new control, now undergoing test service tests, keeps the temperature between 70 and 75 degrees and indicates a wide range control previously reported by the manufacturer. The rapid change in outside air temperatures emphasized the "building" characteristics of the automatic thermostat which is designed to keep the temperature between the minimum and maximum and the thermostat is up to the disposal of the pilot to set it at 60. This difficulty plane was indicated by engine vibration and engine failure and quickly without red structures, and brought the engine failure into the wings.

Bad Weather Beaten

A new look to "sunny" weather landing has come out in the form of "Invisible run" systems. These systems were developed to take the runway of airports. Weathering these systems and helped the new discovery and avoided the storm as a "continuation of the runway" and avoid the storm.

Green and white meandering lights are used to mark the location of the runway at the beginning and end and indicate where lights illuminate the road. The lights are not flush with the ground and are of the type of approach of the incoming plane. The system enables the pilot to land in conditions of low visibility because the runway is seen the first runway light is shown. However, how many feet he is in which to set his plane down. The lights cut the characteristic yellow center runway light and are visible for 410 feet. A thick mist may be only 30 ft.

New Wing For Speed

Best information obtainable indicates that Langley Field has developed a wing section that will also provide new airplane speeds, perhaps approaching 500 miles per hour. The National Advisory Committee for Aeronautics says "the committee" in the report, except to point out certain limitations by the committee. It is safe to state that Langley engineers have passed down on the new phenomenon of the "thick wing" theory. They suggested by small propellers in the report. It is probable also that the NACA development is a step toward the new wing design and possibly without red structures, and brought the engine failure into the wings.

WYMAN GORDON

WORCESTER, MASS
HARVEY, ILLINOIS
DETROIT, MICH.



*Guaranteed
Forgings*

LABORATORY CONTROLLED

PROFIT & LOSS

W Air Associates, Inc., declared the regular quarterly dividend of \$1.15 per share on last preferred (10% cumulative and convertible) stock, payable Sept. 20, 1933. Also the regular quarterly dividend of 12 1/2¢ per share on the common stock, payable the same date.

W Ship-Winner Corporation and Subsidiaries of which Pump Engineering Service Corp. is a subsidiary, for six months ending June 30, 1933, net profit of \$2,526,890, equal to \$4.48 per share on 2,280,700 shares of \$5 per value common stock. Companies with net loss of \$451,982 for the same 1933 period. The Corporation declared a dividend of \$16 per share on the common stock, payable on Oct. 1, 1933.

W Chicago & Southern Air Lines, Inc., for first period ending June 30, 1933, net earnings of \$45,585, after all charges and taxes. Earnings equal more than two and a half times annual requirements on the preferred stock. Companies with earnings of \$23,971, equal to 37 cents per share on the preferred stock, for the first period ending June 30, 1933.

W Continental Western, for quarter ending July 25, 1933, net loss of \$18,775 compared with loss of \$14,669 in July, 1932, quarter. For quarter ending April 30, 1933, net profit of \$11,420. For same month ending July 25, 1933, net loss of \$14,669 compared with loss of \$10,330 in same 1932 period.

W Eastern Air Lines, Inc., for six months ending June 30, 1933, net profit of \$16,143 at 15¢ a share after tax provision of \$180,000. Companies with the profit of \$145,113 at 56¢ a share for the like 1932 period. For the second quarter of 1933, profit of \$110,250, or 44¢ a share, compared with profit of \$43,344, or 16¢ a share, for the second quarter of 1932. Total current assets at the company year date, \$1,777,296 at Dec. 31, 1932, to \$1,693,217 at Mar. 31, 1933, to \$2,967,568 at June 30, 1933.

W Lockheed Aircraft Corp., for six months ending June 30, 1933, net profit of \$102,209 after provision for losses and depreciation, equaling 46¢ per share on 215,000 shares of common stock. Net profit of \$131,974 over net increase for the

same months of 1932, and is the largest profit figure for any corresponding period in company history. Sales for the period of \$12,039,117 compared with \$11,117,970 for the 1932 period, and \$14,274,850 for the entire year of 1933. Total current assets at June 30, 1933, \$5,635,051, compared with \$5,030,971. Earnings at Aug. 1, 1933, \$14,274,850, compared with \$12,039,117 as of same date last year.

W Flier Aircraft Corp., declared the regular quarterly dividend of 15¢ per share on the 50¢ net value preferred stock, payable Sept. 1, 1933.

W Sperry Corp., for six months ending June 30, 1933, net income of \$2,432,832, equal to \$1.21 a share, against net income of \$2,397,775 or \$1.10 a share for six months ending June 30, 1932. Current assets at June 30, 1933, \$15,558,454; liabilities, \$1,359,319; assets \$13,200,035 and \$4,554,700 respectively a year ago. A dividend of \$1 per share was declared payable Aug. 25, 1933, to holders of voting stock outstanding.

W Transcontinental & Western Air, Inc., for the quarter ending June 30, 1933, net profit of \$9,274 compared with a revised net loss of \$132,025 for the same 1932 quarter. For six months ending June 30, 1933, net loss of \$106,457, against a revised net loss of \$671,051 in the same 1932 period. Company net with 1933 figures includes an adjustment of air-craft compensation granted last December.

W United Air Lines, for quarter ending June 30, 1933, net income of \$116,121 after all charges, equal to 14¢ a common share, compared with net loss of \$645,811 for same quarter of 1932. For six months ending June 30, 1933, net loss of \$2,627,792 against a loss of \$18,704 for the first half of 1932. For the month of July 1933, net profit of \$170,637 compared with net profit of \$4,217 in July, 1932.

W Western Air Express, proposed merger with United Air Lines is agreed by many minority and some majority W.A.E. stockholders on the ground that improved financial and legal status would attract creditors. United's application for merger is pending before G.O.A., which had approved interesting-

The 4TH PRODUCTION ORDER of CURTISS SBC DIVE-BOMBERS for the U. S. Navy



Epstein/Photograph U.S. Navy

The U. S. Navy recently placed the 4th production order for Curtiss SBC Dive-Bombers—indicating how well the SBC type has met the Navy's rigid performance and tactical requirements.

In squadrons aboard the U. S. Navy's aircraft carriers and in land-based units for Naval Reserve operations, the Curtiss SBC Dive-Bombers have proven their formidable striking power.

The new squadrons of SBC-4 airplanes now in pro-

duction, like the squadron illustrated above, are powered by 1,000 h.p. Wright Cyclone engines. When completed, these airplanes will render important service duty in the U. S. Government's program of building up a stronger Air Arm for National Defense.

CURTISS AEROPLANE DIVISION
CURTISS-WRIGHT CORPORATION
Buffalo New York

The Power of Aviation

Curtiss

PRECISION-BUILT ARMY AND NAVY AIRCRAFT

Tethering the Airplane

(Continued from page 25)

edge acts as a leading edge with resulting high peak pressures along the trailing edge. This frequently results in pressure sufficient to disengage the structure all of the rear spar. In addition to the trailing edge of the wings, the elevator, elevator and aileron may undergo similar failure. In the case of the control surfaces, the stresses are further aggravated by the fact that unless they are adequately braced they may be moving violently into an extreme position to the extent by wind gusts, resulting in serious danger. This danger may require replacement or extensive repair to the surfaces before the airplane is again flown or, even worse, the damage may be extensive and the airplane may be beyond repair. The following difficulties in the air. Therefore, in this regard, the controls should be braced in a manner so that they are approximately parallel to the ground.

The locking of the controls presents a problem which can probably best be solved by the manufacturer of the airplane. Airplanes equipped with automatic pilots should be tethered with the pilot turned to the "off" position. A practice which has been very common has been to place two ddt fuel tanks, one on each side of the fuselage, placing one end of each hose over a portion of the elevator surface and the other end over a portion of the floor surface. A belt is passed through the gap between them and released by action of a wing nut. This is a simple means of locking the surfaces but presents the dangerous possibility of the pilot getting on his knees and taking off with one or more of the controls locked. Several years ago a large bomber was taken into the air with one of the controls locked. This resulted in a hard crash. Some of the airlines have resorted to a modification of this method. They have installed a cable in the fuselage, the other end being fastened either to a ring embedded in the runway or in a heavy weight placed on the runway. The object of this is, that if the fuselage is not removed before take-off, the cables will pull them out automatically. If the military services and airlines wish to avoid accidents from this cause it is based on the locking of controls

and the possibility of the pilot taking off with one or more of the controls locked, does it actually tether the individual segments to be very careful when he finds a necessity to lock the controls. For this reason it would probably be desirable for the private owner to lock his controls in the cockpit just before a landing because so arranged that it would be impossible to do so in the pilot's seat without first releasing the harness from the controls. It would be very desirable if manufacturers of automobiles for use by private owners would provide a similar device for this purpose.

When the "intentional" Civil Air Regulations were promulgated in 1914 one of the problems encountered by the Department of Commerce engineers was the design of the new regulations was to make adequate provision for the use of aircraft in military service. The "intentional" wing design conditions did not give down loads on the rear spars. To insure that reasonable stresses would be taken down loads were built into the airplane. Condition V (Landed Flight) was included in the Regulations. This condition is emphasized by its name in order that some criterion be available to give a measure of stresses. Nevertheless this provision does not have been used in service where the rear lift span has been determined by wind tunnel where the airplane was tethered and into the wind in a tail down position. In general, it appears undesirable to tether aircraft in the open, in this attitude.

Regardless of whether the airplane is tethered into the wind or tethered into the wind, it is readily seen that unless "spreader boards" are used, the airplane should be in a substantially horizontal position, so that the lift on the wings either up or down will be reduced to a minimum. The airplane with its cyclic landing gear automatically has the desirable characteristic of being in a substantially horizontal position. Just another good point in favor of this unusual type of gear which will undoubtedly be the conventional gear of the future.

Scorpions as well as other land or water animals have their wings at a relatively small angle to the wind. From the above, it appears obvious that the best procedure would be to

place the airplane in an approximately horizontal position facing into the prevailing winds, properly released down, with wheel chocks in front and back of each wheel, with jacking brackles up, with tail wheel locked in line and all positions, and with controls locked. These are two ways in which the airplane may be placed in a horizontal position. One would be by placing the tail wheel on tail chocks on a substantial pedestal. (See Fig. 1) The other would be to roll the main wheels into a shallow pit so that the fuselage would be slightly level and just clear of the ground. (See Fig. 2) The former was used by the Army Air Corps Experiment and proved very satisfactory. The latter was used by the Navy, however, to make sure that the pedestal is substantial and that the tail will not be blown off as it is. The wheels should be properly blocked and the airplane wings tied down to substantial stakes or anchors buried in the ground. The shallow pit in which the main wheels may be released provides an excellent means of blocking the wheels. There is no danger of the tail blowing off as it is protected as it will now lie in the ground. There is a further consideration favoring this procedure. It is well-known that there is a considerable velocity gradient varying with altitude. That is to say, at high altitudes the wind velocity may be considerable but the velocity decreases very markedly as the ground level is approached. This effect is combined with that of water flowing in a stream. The water that is in the middle of the stream (far from the banks or bottom) flows at a high rate whereas the water adjacent to the banks or bottom flows at a relatively slow speed. Knowing this as usual the manner to tether the airplane is, the tail will be in the water and hence the lift the fuselage wing area is. There is a possible disadvantage in the crosspower, whereby the wind and wind velocity blows along the surface of the ground will strike an airplane tethered in a pit to a greater extent than when released above the ground. The importance of this consideration will depend largely upon the conditions of the field on which the airplane is tethered. In general it would be preferable to tether airplanes and in the open where they might be subjected to an appreciable amount of "hard blowing".

In all cases where animals are tethered, all openings, such as air scoops for ventilation and cooling and open cockpits, etc., should be suitably covered. To be continued on an early issue



What will Curtiss-Wright Tech training do for you?

The wise investor always determines in advance what the return will be on his investment before he puts cash "on the line". You, who plan to invest in a course of training to prepare you for your future, must do the same. It is even more important to you, since your choice of training will determine how much money you will make all the rest of your life. Curtiss-Wright Tech career training is carefully designed to do just one thing—MAKE MONEY FOR YOU, and for all other Curtiss-Wright Tech graduates.

Our hundreds of successful graduates prove that Curtiss-Wright Tech training gets results and at ways pays. It has provided them with a profitable occupation and secure future since it trained them in advance for the highest position they could ever expect to occupy. IF CAN DO THE SAME FOR YOU.

We invite your consideration, investigation and comparison. The handy coupon will bring you full details. Use it.

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AVIATION
Courses, 1921

AVIATION OPERATORS CORNER

500 Seaplane Bases for New York

A goal of 500 is set for the number of seaplane bases to be built throughout New York State by the end of the summer. The plan is part of a nation-wide program to establish these bases as seaplane stations and as long-term outposts through the cooperation of the NYA, who fund the labor, the CAA, who furnish the regulations, and the local authorities who own the base who furnish the materials.

As a result of this program, so far, seaplane landing facilities have been established along a shoreline route extending from Maine to Key West, and along the Gulf of Mexico from Key West to Louisiana. A network of bases is also being established in the Great Lakes region and in the Mississippi Valley as well as along the Pacific Coast.

The series opened in New York State has been planned to connect the Atlantic Coast with the Great Lakes region. An air line was made to connect open 17 of the bases and aircraft participating were the Howard H. Webb Aircraft, Secretary of Commerce and former Chairman of the CAA; Richard L. Lewis, President, and George P. Ford, Vice-President of the New York State Aviation Association, Robert A. Lewis, Chairman of the New York State Aviation Association, and Captain Robert S. Fenn, of the CAA.

New dealers and new routes for Airlines can be kept open by one New England through the work of the Texas City Airlines of Boston. Three dealers have recently been established with David Bush, operator of the Vermont Airways, as a dealer for Cape Cod and the islands of Martha's Vineyard and Nantucket. Harold Pugh of Plattsburgh of Airline of Burlington, Vermont, has been appointed distributor for the entire state and John Giffin, operator of the Everett Airways, is to take care of southern Massachusetts plus Rhode Island.

State dealers were recently given the War Relocation Authority Convention and the West Virginia Flying Service is also giving flying schools and a pro-



MICHIGAN'S FIRST: Crystal Lake, at South, furnished the site for this new seaplane base. It is the first in the state to be built under the CAA-NYA program.

and flying services. Representatives of the Airport Commission were J. C. Bauer, Jr., R. T. Rupp, Charles J. Tipton and E. B. Crawford. The capital stock was placed at 100 shares at \$100 each with a capital of \$10,000.

Management of Metropolitan Airport in Detroit, Mich., by David Bush, owner, is announced by John A. Lewis, Secretary of Commerce and former Chairman of the CAA; Richard L. Lewis, President, and George P. Ford, Vice-President of the New York State Aviation Association, Robert A. Lewis, Chairman of the New York State Aviation Association, and Captain Robert S. Fenn, of the CAA.

We saw a law, according to a recent CAA statement to common 1934, that a modern pilot following the CAA regulations can get his private air certificate at the end of 21 hours. This is of course, provided the instructor has been licensed under the new requirements. The entire culture has been under experimental use for a considerable time but new business opportunities have been found in sports like is required and 12 hours solo time, with at least 3 hours to be used in cross-country flight which shall include at least one flight over a course of not less than 50 miles

with 2 full stop landings at 15-minute points.

In the city changes for 1934, the National Association of State Airports Officials will hold its 30th Annual Convention, October 15, 16, and 17, New



NEW WIND: A feature of the Postville item was the wind, and it was capable of launching a ship at 10 mph.



GLIDER GADGET: A small glider attached to the launch cable is shown after release at the American Open Seaplane Meet at Postville, Mich.



W.A. VIA GLIDER: (Sten Grooms of Postville, Mich., is) launching a glider to Postville Jerome Williams at the 1934 State Meet, following a 10-mile flight with Williams at the controls, at Postville, Mich., as passenger.

Grimes' Hotel Postville will be the place. Discussions include private State airports, and construction and law, attending to a recent announcement by President Lee Sturges of Connecticut.

Successful day for Seaplane Meet: The Seaplane Meet at Postville, Mich., was a success. The program was being set up by the Seaplane Meet. The program was being set up by the Seaplane Meet. The program was being set up by the Seaplane Meet.

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must on September 30th. The field now has a complete emergency system and improved terminal building facilities. The program was being set up by the Seaplane Meet. The program was being set up by the Seaplane Meet. The program was being set up by the Seaplane Meet.



Carl E. Johnson of Cleveland, Ohio, has recently been named the State's new Director of Aeronautics. Mr. Johnson is a former member of the Seaplane Meet.

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TAGGING THE BASES

with LES HENGE



Light Plane Makers Get Together

Cleveland was full of light plane makers, and their representatives during the week of the week and one of the best things that happened was the meeting at which officials of the three leading companies met to discuss the future of the light plane. The meeting was held at the Hotel Cleveland, and it was a very successful one. The meeting was held at the Hotel Cleveland, and it was a very successful one.

Light Plane Makers: The light plane makers met in Cleveland, Ohio, to discuss the future of the light plane. The meeting was held at the Hotel Cleveland, and it was a very successful one. The meeting was held at the Hotel Cleveland, and it was a very successful one.

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MAJOR AD WILLIAMS, also "Yellow Wing Tee"
Wm. Earl Rogers Products, 2411 15th, Louisville, Ky.

Accord will wealthy Arab had two sons
This being the 20th Century, instead of a



I still at least high-powered computers which worked up all sorts of short-term trading systems. There were no markets of course.



10-10-1961



GULF
AVIATION
PRODUCTS

That looked like death. Our men were called in now in dark protective clothing that

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LARGEST AND MOST CIVIL AVIATION

you will find the Eastern Divisional Headquarters of the Civil Aeronautics Authority engaged in issuing certificates to pilots, pilots and mechanics, **you will find** advanced students, under an instructor, overhauling, repairing and rebuilding licensed planes of every kind that must be kept flying, **you will find** a complete faculty, each member of which is an experienced expert in five subject he teaches. **You will find** that these advantages cost you nothing, but add a great deal to the value of SCOSVELT TRAINING.

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DOUGLAS TRANSPORT, WRIGHT ENGINE, AND
B&G SPARK PLUGS AT AMSTERDAM, IN HOLLAND



On its TWENTIETH ANNIVERSARY we congratulate K.L.M.,
another of the world's great airlines that
uses B&G Mike Insulated Spark Plugs as Standard Equipment

THE B&G CORPORATION

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136 WEST 52nd STREET, NEW YORK, NEW YORK

5 PLANT 20
October, 1939
24



KLM (ROYAL DUTCH AIR LINES) powered by WRIGHT CYCLONES

Twenty years ago, when K.L.M. (Royal Dutch Air Lines) was established, the airline route covered a distance of 250 miles—from Amsterdam, Holland, to London, England.

Today K.L.M. routes cover over 15,000 miles. They extend from Scandinavia to Java—connect the West Indies' island of Barbados with Trinidad—continue to Caracas and Arica—and serve Panama, La Guayra, Cienfuegos, and Tampa along the north coast of South America.

Wright Cyclone engines have played a vital part in the extraordinary growth of K.L.M. Cyclones power all of K.L.M.'s great fleet of Douglas airplanes which

have reduced travel time from Amsterdam, Holland, to Batavia, Java, to 7½ days—compared with three weeks by fastest over-water travel.

Wright Cyclones also power K.L.M.'s fleet of Super-Speed Lockheed 14 Transports, now in service on its important West Indies and South American routes. Planes of this type are also in service on routes of its associate company, K.N.I.L.M. (Royal Netherlands Indian Airways), in the Far East.

WRIGHT AERONAUTICAL CORPORATION
Paterson, New Jersey
A Division of Curtiss-Wright Corporation


WRIGHT Aircraft ENGINES

Hail to the "FLYING DUTCHMAN"

• KONINKLIJKE

• LUCHTVAART

• MAATSCHAPPIJ

—celebrating its twentieth anniversary as the world's first major airline—a name around which future Kiplings and Conrads may well sing their sagas of the air—a service covering over 15,000 miles of airways linking together Occident and Orient! It is your pride that K. L. M. is synonymous with safe, dependable, travel—it is our pride that you have standardized on KOLLSMAN PRECISION INSTRUMENTS

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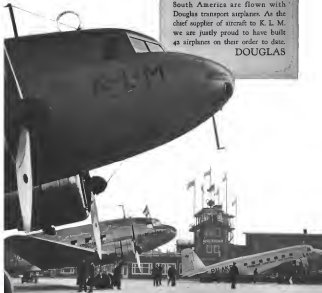
AVIATION
Circle 133

"Some day we will fly to the Dutch East Indies in a Douglas, I as commander and you as a wireless operator."



On its 20th Anniversary we salute K. L. M., the world's longest airline. "Amsterdam to Batavia in 5 1/2 days" typifies the great efficiency of the Royal Dutch Air Lines whose principal routes serving Europe, Asia, Africa, Australia and South America are flown with Douglas transport airplanes. As the chief supplier of aircraft to K. L. M. we are justly proud to have built 42 airplanes on their order to date.

DOUGLAS



DOUGLAS



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THE SUN NEVER SETS ON AEROL STRUTS

In every corner of the world where men have blazed trails through the unconquered air, ships are making safer take-offs and landings on Aerol Struts. Among our valued customers are the Royal Dutch Airlines. We are proud to feel that our equipment has contributed very definitely to their outstanding safety record.

Under every conceivable climatic and geographical condition these air-and-oil shock absorbers have demonstrated their complete dependability. In the sub-zero weather of both Poles—in the blazing tropics—their performance justifies their stand-

ing as the first choice of aviation engineers the world over.

Under the present disturbed conditions, the ability of Aerol Struts to facilitate safer landings and take-offs on rough or damaged surfaces is of particular importance. They also insure uniformly resilient, controlled support regardless of the variations in the ship's load.

Aerol Struts may be engineered into any plane. We will gladly send you complete information and offer the service of our engineering department.

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CLEVELAND OHIO U.S.A.



AEROL shock absorbing STRUTS

AVIATION
SHOCK ABSORBERS
55

BENDIX

BENDIX RADIO

AIR RADIO NEWS

OCTOBER 1939

Published by BENDIX RADIO CORPORATION, Richmond, Md.

Cable Address: BENDIX

NEW K. L. M. DC-5's COMPLETELY RADIO-EQUIPPED BY BENDIX



New Bendix DC-5 Aircraft ordered by the Royal Dutch Airlines (K.L.M.). This plane outfit is radio-equipped with a Bendix T.A.2. Cabinet 150 watt transmitter, EA-1 communication receiver and Radio Direction Finding Equipment. K.L.M. is extremely satisfied with Bendix Radio in several years under all types of flight conditions has absolutely proved Bendix Superiority.

Bendix Celebrates K. L. M. on Its 20th Anniversary

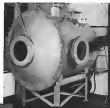
The Bendix Radio Corporation extends hearty congratulations to K.L.M. for its fine record of pioneering, progress and development during the 20 years of the Netherlands. Also the Bendix Radio Corporation wishes to record its thanks to the K.L.M. engineers with whom it has had the pleasure of working in the development of Radio Equipment which is now in use practically throughout the K.L.M. routes.



In Europe, Bendix West Union, K. L. M. 45 Transmitters are as much in use as in their native Holland. The K. L. M. Lockheed 14C-5's as well as the new DC-5's are radio-equipped by Bendix. The widespread use of Bendix Radio throughout the world is proof of its increasing dependability and also of Bendix's ability to serve its customers completely.

Royal Dutch Airline Lockheed 14's Also Have Bendix Transmitters, Receivers and Direction Finders

Bendix Research Provides Reliable Performance in Both Northern and Tropical Flying



Bendix Radio Airborne Radio Equipment. An outstanding record for the superior performance of Bendix Radio Equipment in the toughest testing under combined flight conditions which every piece of airborne receiver during their operation and production.

The top illustration shows the Bendix Vacuum Character Prediction Test Transmitter used to test under conditions simulating its altitude of 25,000 feet while operating in critical situations.

The illustration at the left shows the specially designed Radio Transmitter - Receiver Chamber in which all types of equipment are tested. Production Units must operate satisfactorily at temperatures between minus 60°C. and plus 60°C. Reliability is high as every production transmitter is tested in these conditions.



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BREAKS ALL PREVIOUS RECORDS



In winning the 1929 Bendix Race at the National Air Races in Cleveland, Frank Fuller equipped his plane with the new consolidating high pressure pump engineered by ROMEC.

For maximum dependability, choose ROMEC Pumps—the pioneer for years in high precision manufacture

for maximum safety and dependability.

For years ROMEC Pumps have been used by the majority of the world's largest aircraft manufacturers, the leading transport companies in the United States and by the overwhelming majority of the record fleet in aviation history.

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AVIATION
October 1929

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We extend our sincere
congratulations to

K-L-M

on this the 20th anniversary
of splendid achievement.

We are very proud of the part
Bendix-Scintilla
Aircraft Magnetos
have played in the fine record.



SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK

HAPPY BIRTHDAY, K-L-M!



Congratulations, K-L-M, on twenty years of progress in commercial aviation during which time you have contributed handsomely to the advancement of aviation. You and other airlines have shown that peace lies in the skies—for greater than those of war.

We are glad that as K-L-M transports, as on these lands of other passenger ships and military planes throughout the world, the CAMBRIDGE AUDIO MATURE INDICATOR contributes to fuel economy and engine protection. This light instrument indicates continuously

Fuel-Air Ratio of engine mixture by analyzing contents of exhaust gas. Calibrated over a range of 11 to 146, it guides the pilot continuously in controlling economy, the all-important mixture ratio of 15:1 level on high speeds. The Cambridge A. A. I. helps offset high engine performance when any one of several factors—ignition, atom fuel pressure, increase in pressure—prevents safety by indicating the pilot in the minimum length of time when fuel supply is low.

Models for 1, 2, 3 and 4 engine aircraft.

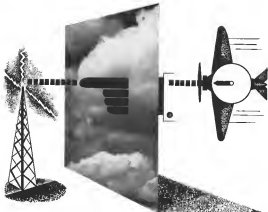
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AVIATION
October 1929

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"There is your course... EXACTLY there!"

says the Learadio Automatic Direction Finder

Here is the most winning co-pilot you have met yet. He weighs less than fly pencils and occupies no seat, let be understood with the power to see a distance point through hundreds of miles of space, to pierce the darkest veil of darkness



and fog, to say confidently and reliably to the pilots with his hand: "There is your course—exactly there!"

A miracle? Perhaps. But a practical reality, for that is precisely what the Learadio ADF-6 Automatic Direction Finder can do for you! It points—and stays pointed—in exactly where you want to go—and you simply go where it points. It gives instant, continuous, real visual orientation. It establishes your position quickly, easily, and clearly.

The ADF-6 operates throughout the entire 360° compass—completely eliminating 180° ambiguity. It tells you the course you have reached your destination. It enables you to "home" on any of

the countless number of radio transmitters, commercial broadcasting stations, or Coast Guard stations located in strategic positions everywhere!

Practically a powerful radio receiver offering precise, rapid direction finding on the frequencies between 150 and 3000 KC (with an additional band for com navigation between 3500 and 6700 KC), the ADF-6 is the greatest advance in automatic direction finding on the market today! We would enjoy giving you a demonstration of its spectacular performance. Write for full particulars. This and other Learadio products are built to A.T.C. requirements and are available for outfit use, as well as private.

LEAR DEVELOPMENTS, INC. *Research Field, Minn., & L. P. P. Cable Address: Lear Corp. Western Representative: Wilbur J. Dugg, Los Angeles, Denver, Cleveland, Cal.*

AVIATION
October 1950
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The new Aeronautical Engineering Building contains four stories, each 30 x 50 feet.

PARKS Adds to its Facilities for Training You for Success in AERONAUTICAL ENGINEERING



A group of Parks Aeronautical Engineering students are employed by Lockheed great Officer Parks in a recent semester.

Do you hope to make important contributions to the development of aviation—and to advance to one of the highest positions in the industry? If so, you'll be interested in the Aeronautical Engineering Course at Parks.

Here's why! The Parks Aeronautical Engineering Course includes 3000 hours of instruction—more than set required for graduation from the average four-year university course!

Class and laboratory instruction in the Aeronautical Engineering Course includes:

- 500 hours of Mathematics, Physics, Engineering Mathematics, Elements of Mechanics and other basic subjects.
- 300 hours devoted to the application of basic principles in the subjects of engineering problems in such subjects as Aircraft Design and Aircraft Site Construction.
- 300 hours in Aircraft Mechanics, engineering knowledge and developing skill in the shop.
- 300 hours in Engineering Drawing.
- 300 hours are given over to background or enrichment courses.

With the completion of the new Aeronautical Engineering Building and two new dormitories, Parks has expanded the school's physical plant to 15 buildings, all of which are designed to accommodate increasing enrollment. Moreover, Parks is equipped to ensure you the highest type of specialized training in Aeronautical Engineering.

The several components of Parks graduate in the aviation industry, and that subsequent period of service, is your guarantee of the value you can derive from the high educational standards set by Parks.

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Class in airplane workshop.



Still doors closed in airplane design.



HSI hours spent in shop.

PARKS AIR COLLEGE

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2000 hours in the shop

Parks Air College

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AVIATION
October 1950
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Jacksonville scores high in all of the dominant elements affecting new industrial establishments or plant relocations:

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POWER AND FUEL—the municipally owned electric plant provides adequate power at low cost. Fuel is cheaply obtained due to Jacksonville's proximity to a oil center and seaport.

CLIMATE—(SUNSHINE)—an ideal climate, low living costs and an income tax situation and substantial facilities contribute to pleasant living.

TRANSPORTATION—four truck lines, railroad, deep water harbor with regular steamer service to Europe, South America, Pacific, Gulf and Canadian ports. Travel time and service. Travel expense throughout the Southeast. Jacksonville is a major center.

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If your airport runways are planned to support modern planes, you'll save money from the start with concrete. For every major airport where comparative designs are made for present and anticipated wheel loads, concrete will usually be found lowest in first cost.

In addition—concrete saves huge sums on maintenance compared with other construction. Floyd Bennett field, for instance, needed no maintenance expense on its concrete runways in ten years of heavy traffic.

Plus values in concrete are these: all-weather dependability, non-skid safety, high visibility, cleanliness and durability.

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PORTLAND CEMENT ASSOCIATION

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A national organization to improve and extend the use of concrete... through scientific research and engineering field work.

Des Moines is ready for the big planes with mile, multi-lane concrete. 363 acres, 110 ft. by 4500 ft., 3' W, 200 by 4700, 3' W, 100 by 4700, 3' W, 100 by 1200. John Tipton, city engineer.

New concrete runways were recently completed at six under construction at St. Joseph, Mo.; Wichita, Kans.; Louisville, Ky.; Marshall Field, N. Y.; Hamilton Field, Calif.; Louisville Field, San Diego, Calif.; Kansas City, Mo., and Elizabeth, N. J.

Going Places In 1940? . . . Then Let This FREE MANUAL Help You



You will find that this Manual explains plotting and flight technique from the ground up. It has been specially compiled by the editors of AVIATION to meet the needs of Students, Pilots, Mechanics, Flight Officers, Fleet Base Operators, Transport and Auxiliary Work. It is yours, without cost, with your subscription to AVIATION—the monthly issue of which brings you equally practical ideas for making your way in your chosen work.

Just a sample of the authors' stories and subjects will tell you that here's a book you've got to have. Lt. Commander F. W. H. Wiggins tells you how to find your way in the new—Dead Reckoning, Celestial, Coastal Navigation, etc. John F. Day tells you all about the radio signals and how to qualify as an aviator. J. A. Caswell explains atmospheric flight and takes home flying. And he tells you of the lavishly and difficultly newly constructed and how to overcome them. He tells you how to find a place where the sailing is down on the coast. Roy Paul tells you all about radio navigation and how to use it. Frank J. get across aviation by Del Frisco and Harry on the frontiers of air navigation. D. W. Lindholm gives you all the news on the latest developments. Edmund T. Allen gives you the low-down on flight testing. D. J. Brown, Jr. tells you all you have to know about water flying operations. The Editor tells you all about previous operations. There are many others too.

This book will help you realize your flying ambitions. The questions and answers of typical questions of Common sense—these will save you hours of work and study.

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AVIATION
October, 1940
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Wings that Shrink the Ocean

Ships that head out to sea can afford no compromise where strength is concerned. Ability to meet the stress and strain of sustained flight is imperative. Seaworthiness must match performance in the air.



For flying equipment today

for complete aircraft houses



In the early Clipper ships with which The Glenn L. Martin Co. provided the means of putting transoceanic flying on a regularly scheduled flight basis, Ohio Seamless Tubing simply demonstrated its ability to supply structural strength with minimum weight. Its use in the 63,000 pound, 33 passenger Martin Ocean Transport was the natural result of the company's wide experience with its proven characteristics. Ohio Special Quality Seamless Tubing is used extensively in the late models of Martin fighting and defense aircraft and commercial planes.

Where existing specifications demand careful selection of tubing, call in an "Ohio Seamless" sales engineer. His help may prove valuable.

AVIATION
October, 1940
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